Pit and Quarry

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THE THREE ANNUAL CONVENTIONS

THIS year, the three annual conventions that are important to producers and manufacturers of non-metallic minerals, should be unusually stimulating. Each has numbers on its program that promise interesting discussion and advancement. Not the least benefit derived from these gatherings is the opportunity afforded to become acquainted with our neighbor whose cooperation is as necessary to our success as is our cooperation to his success. The intimate contacts and exchange of ideas and methods by those whose interests are common, make for mutual advancement. The success of an association should, therefore, be measured by benefits to the industry as a whole as well as to individual members.

Sand and Gravel Convention

The Thirteenth Annual Convention of the National Sand and Gravel Association opens Wednesday morning, January 9, at 10:30 in the Hollenden Hotel.

After the president's opening address and Mr. B. F. Hopkins, City Manager of Cleveland, has welcomed the convention, the address, "Know Your Association," by Dr. Hugh P. Baker, Manager, Trade Association Department, United States Chamber of Commerce, will be given. Dr. Baker is considered the leading expert of the country in trade association activities, and his message will be instructive to the sand and gravel industry.

Mr. J. A. Heaman, Chief Engineer, Grand Trunk Railway, will speak on "The Use of Gravel as Railroad Ballast." His discussion should be interesting because he is in position to reflect the viewpoint of an important market.

Mr. Norman Beggs of the Portland Cement Association will read a paper on "Manufacture, Delivery and Sale of Ready-Mixed Concrete." Mr. Beggs has recently completed a nation-wide survey of central mixing plants. The discussion to follow should prove most valuable to every operator.

Road Builders' Convention and Show

The American Road Builders' Association will discuss many topics of current importance, and more and more are making for standardization in highway construction and maintenance. Indeed, this association has widened its scope of operation until its many divisions deal the entire field.

The keen interest manifested in the coming convention by all who have to do with road building testifies to the magnificent work and power of this organization.

The Twenty-sixth Annual Road Show of the Association affords buyers of road building and maintenance equipment the greatest display of all time of machinery and supplies, and it is, perhaps, the greatest single factor in the advancement of road construction, quality and methods.

The designation of Saturday, January 12, as Manufacturers and Distributors Day seems to be a practical step forward. On that day, manufacturers may have close contact with their principals and inspect and discuss exhibits. A joint meeting will be held at which discussions of particular interest to the members of the Manufacturers Division will take place.

National Crushed Stone Convention

The annual convention of the National Crushed Stone Association opens Monday morning, January 21. Much important business will be transacted. Perhaps the most progressive step taken by the Association is the establishment of its own testing laboratory. Any reports on its status will be of lively interest.

THE NATIONAL POWER SHOW

THE National Power Show at the Grand Central Palace, New York, is the most successful exposition of its kind ever conducted. It surpassed all previous achievements in the display of power and mechanical engineering equipment and clearly demonstrated that it is the largest and best exposition of its kind in the world. All past records for attendance and registration, as well as number of exhibits, were broken. The attendance of 118,000 engineers, industrial executives and operatives proves conclusively the value of such an exposition. This interesting audience came from every industrial center in the United States and the world-wide interest of our National Power Show was manifested by more than 300 foreign visitors who came from 35 foreign countries. This active, live interest displayed annually by users and buyers of power and mechanical engineering equipment is the reason why 540 manufacturers in this field assembled from all parts of the country to exhibit their products. The 225 new exhibitors at the National Power Show this year materially strengthened the show in its mechanical engineering branches. The large number of moving exhibits were especially in evidence and incidentally attracted the greatest amount of attention. The exhibitors of such equipment, upon inquiry, have stated that the benefit they derived from the extra time and expense put forth in the arrangement of such displays has more than repaid them for their efforts. The new products shown for the first time drew much favorable comment.

A most interesting comment came from U. S. Senator Ashurst of Arizona in his address at the National Power Show. In part he said, "I wish all Congress could see this exhibit. You men of the mechanical art are now masters of the world's widest estate. Our national energies for centuries were employed in building up the country—making the country habitable and eligible to get a market, and now the nation is turning its attention to what I might call 'the World's Widest Estate.' You men of the press call yours the Fourth Estate, but this, the Fifth Estate, I might put it, is, I think,. the most dramatic, the most mysterious and the most universal. It is only seventy odd years ago that we were throwing away and rejecting coal tar as a foul smelling, mussy substance, but you men of science now take coal tar and make seven hundred different things from it. You men of science have given us tons of steel and with these we have made the highways of the world. We have heard and read for years of voices of the air—you remember that the poet wrote 'and the air shall be filled with voices,' and today you men of science have given us the radio. We are living in the most marvelous, most complex age the world has ever seen. I am sure the ancients would have been astounded by what this age has done. And it is all of a utilitarian nature. These things are not implements of war—agencies of destruction. These great agencies are thought out and prepared by men of peace who want to make life happier and more useful. You are to be congratulated. I regard this Exposition as conspicuous and important because it symbolizes the progress of the world." It is almost safe to say that the Senator will not miss the opportunity of seeing the next National Power Show.

I. E. Moultrop, of the Edison Electric Illuminating Company, Boston, and chairman of the Exposition Advisory Committee, had the following comment to make: "This is a serious exposition for serious-minded people, the roots of which will penetrate throughout every industry. New ideas were demonstrated and much new equipment was in evidence; the visitors did not expect to find startling innovations. However, there were a number of most unusual and interesting displays of material and equipment, some of which will find their way into power plants throughout the world very shortly."

At the time of the opening of the exposition a message from Charles M. Schwab was read: "My heartiest congratulations on the opening of the Seventh Annual Exhibition of Power and Mechanical Engineering. The progress that has been made each year in this all important field makes this a significant event in the industrial development of the nation." The keen insight of men great in public service such as Senator Ashurst and Charles M. Schwab proves the value of the National Power Show as a means of enlarging their vision and each year its value is becoming more deeply impressed upon every man in industry.

More than fifty universities and technical schools sent representatives to this great industrial institution, which has become recognized by colleges throughout the country to be one of the best mediums for acquiring intimate knowledge of the latest and best developments in the power and mechanical engineering fields. In addition to professors and students from practically all nearby colleges and universities, many more traveled thousands of miles to attend. The universities of the West were represented by eager, anxious young men and serious-minded instructors who came great distances to study this huge living catalog of engineering products at first hand.

The National Power Show performs the remarkable service of being the clearing house for the latest information relating to the important developments of power and mechanical engineering.

MEN OF THE INDUSTRY

The portraits printed on this page in each number of PIT and QUARRY are taken from our files and their selection is without significance as to current events or as to the position of the individual in the industry.

Holgan Struckman

Mr. Struckman is President
of the International Cement Corporation
of New York, New York

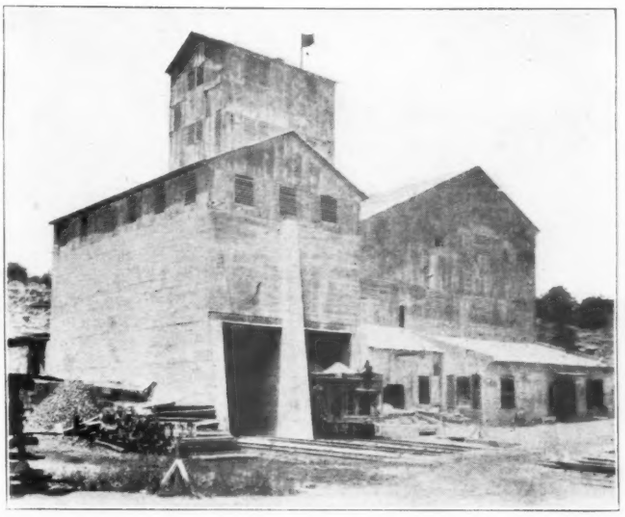
THE LEHIGH PORTLAND CEMENT COMPANY PLANT AT MITCHELL, INDIANA

THE Lehigh Portland Cement Company at Allentown, Pennsylvania, about three years ago started the work of replacing and overhauling the machinery and equipment of the cement mill at Mitchell, Indiana. At that time this plant, one of the oldest in the country, was operating two mills, one of 2,000 and one of 4,000 barrels capacity. Under the rejuvenation program, which is still being carried on, the company has replaced most of the old machinery and equipment with new, and what was not replaced has been overhauled. One of the mills was shut down and is now being dismantled. The other, known as plant No. 2, has been modernized and brought up to date in every particular. The result is one of the most modern cement mills in the country. It produces a higher grade product at a lower manufacturing cost and the production has been materially increased. It has a capacity of 6,000 barrels a day and the total output for 1927 was 1,353,572 barrels.

When this plant was first established in June, 1906, it had a trade territory which included Duluth on the north, Cleveland and Wheeling on the east, Memphis on the south and central Missouri on the west. Since that time many cement mills have been established in this territory, limiting the trade territory of this plant to Indiana, southwestern Ohio and southern Illinois.

Following a survey of the needs of the plant, the stone storage was re-arranged, sixteen large blending bins of the silo type were built and in the power department large Corliss engines were replaced with General Electric 2500 kw. turbo-generators and the necessary auxiliary power equipment.

The most important parts of the entire program were the construction of the new blending bins by the MacDonald Engineering Company of Chicago and the reconstruction of the power department by the Middle States Construction Company of Columbus, Ohio. There are 16 new blending bins, each 14 feet 6 inches in diameter and 50 feet high, with a total capacity of 41,000 barrels.



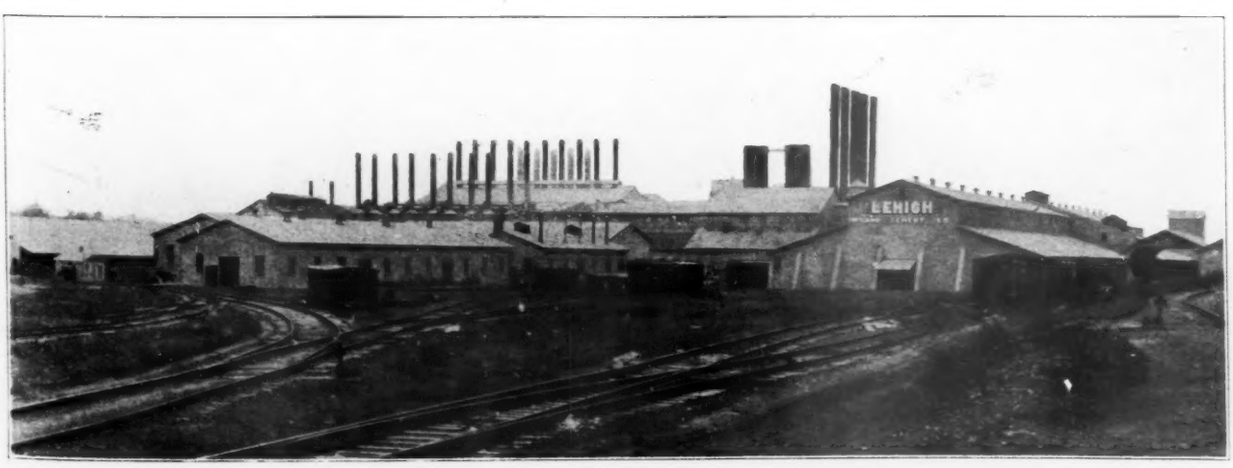
Storage Bins at the Quarry.

To conserve the water supply, a large spray pond was installed to cool the water for re-use in the condensers and the circulating water lines connecting this pond with the condensers in the plant were constructed of 30-inch diameter concrete pipes furnished by the George C. Bartram Company of Buffalo, New York.

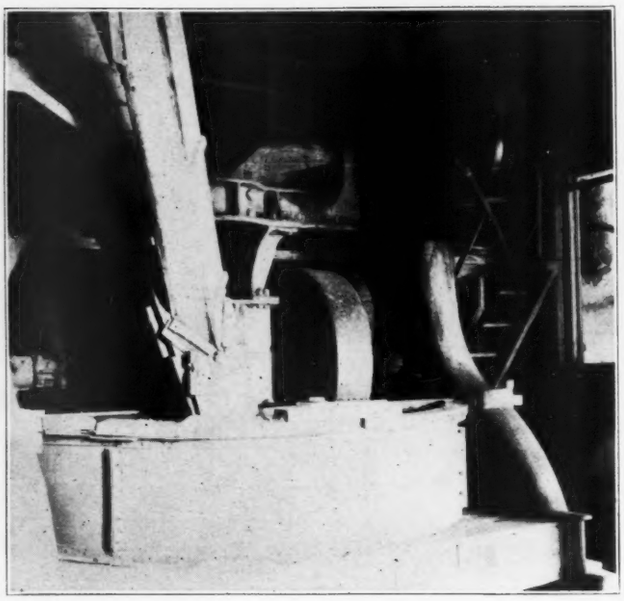
The plant consists of 24 buildings on a plot of about 60 acres on the eastern edge of Mitchell. Fourteen of the buildings are of concrete, two are steel and eight are frame. An average of 450 men are employed. Power to operate the machinery is manufactured in the company's own power house.

Quarry Operations

Stone is obtained from the company's own quarry, about two and a half miles north of the



General View of Plant Showing Cement Storage House on Right.



The Dry Pan.

cement mill, where the company owns about 400 acres of good stone land. It is a stratum of Mitchell limestone, more than 200 feet thick and of uniform quality. The quarry proper, including the acreage that has been worked and stripped, consists of about 40 acres. The first bench is about 90 feet high, and the second about 40 feet. Tests have shown that below this second bench there is 80 feet more of stone available. Work is progressing now on both benches, the second one having been opened recently.

The overburden consists of about ten feet of clay, soil and loose shell rock. This is now a minor factor, however, since they are going down for their stone and will be for the next twenty years, so that all stripping operations were closed down early this year and will remain closed. The overburden was removed by steam shovel and dump cars.

For shooting the ledges, a Clipper well drill is used, with a six inch Gill patented bit. Six inch holes are sunk to the floor line, which varies in depth slightly in the upper bench according to the slope of the surface, but is around 90 feet. In the second bench the holes are sunk almost uniformly 40 feet deep.

For supplying air to the Ingersoll-Rand jackhammer drills, of which there are ten, an Ingersoll-Rand two-stage Type 10 air compressor is used, with 14 inch steam cylinders, 28 inch stroke, and 13 and 22 inch air cylinders. Ten men are employed with drills to break up the stone so the shovels can handle it. The entire quarry employs from 100 to 110 men. Electric power is used for all the quarry machinery except the steam shovels and the jackhammer drills. Steam for the air compressors is generated by a battery of four horizontal tubular boilers. Two of these are Chandler & Taylor make, 72 inches by 18 feet; and two are Brownell make, 60 inches by 16 feet.

Three Model 91 Marion steam shovels, with 3½ yard dippers, are used to load the material into 10 ton end-dump cars. These cars, of which there are 35, were made in the company's own shop. They are hauled by American steam locomotives, one of 35 tons and three of 25 tons. The 35 ton locomotive formerly was used for stripping opera-

Shovel Loading Cars in Quarry.

tions, but now that stripping work has been discontinued, it is being used in the quarry.

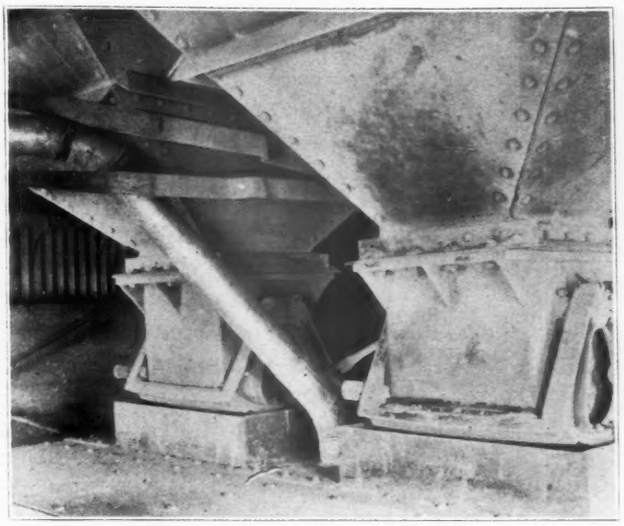
Primary Crushing

In the crusher house a Model 21 Allis-Chalmers Gates crusher does the primary crushing, reducing the stone to six inches and under. From there it is carried by chutes to two Model K Gates crushers, which reduce it to two and a half inches and smaller. The capacity of the Model 21 is 2,000 tons in a nine hour day, and of the Model K, 1,000 tons each for the same period. The crushers are driven by a 300 hp. 2080 volt General Electric motor.

Storage at the quarry is provided by a concrete bin with a capacity of 1,500 tons. It is used only to provide a balance between the amount produced at the quarry and its movement to the cement mill, and furnishes storage for a three to four hour run. The material is hauled to the mill in 50 ton high side drop bottom steel cars made by the Pressed Steel Car Company of Detroit, Mich. The company has 49 of these cars in this service. Motive power is furnished by a locomotive supplied by the Baltimore & Ohio railroad.

Rock storage at the plant consists of one large bin, 125 by 300 feet, supplied with tunnels for feeding the material out on conveyors. It has a total storage capacity of 20,000 tons and is used for both stone and shale.

The stone used in this plant has a very high lime content, running about 92 to 98 per cent pure calcium carbonate. Two grades of shale are used to give the right proportion of silica and other chemical content. About 80 per cent of stone is used, and 10 per cent each of the two grades of shale. A very small amount of gypsum also is used at the finish in the mill to regulate the setting qualities of the finished product.



Hopper Scales for Shale and Stone.

Shale Quarries

The shale comes from two quarries owned and operated by the company. One of these is at Sparksville, 16 miles east of Mitchell, and the other near Brownstown, 38 miles east. Both quarries are on the Baltimore & Ohio railroad, and the shale is hauled to the plant by a locomotive furnished by the Baltimore & Ohio. Twenty cars of the same type as used in the quarry are used in that service.

At the Sparksville shale deposit, the company owns 71 acres and is operating a 125 foot bench. The overburden here is very light and is removed by horses and scrapers. It is a hand operated quarry. After the ledge has been shot, the material is loaded into one ton dump cars by hand and hauled to an Allis-Chalmers No. 5 Gates crusher, where

Spray Pond at Lehigh Plant.

the material is reduced to two and a half inches and smaller. One Clipper well drill and one Ingersoll-Rand jackhammer is used, both of these being operated by compressed air supplied by a portable Ingersoll-Rand gasoline operated air compressor. From 200 to 250 tons of shale a day is produced at this quarry.

At the Brownstown quarry, the company owns 134 acres. A 90 foot bench is being worked now, and tests have shown another depth of 40 feet under that. The company has been working this deposit for 20 years and has removed only two and a half acres, so it is considered that there is an unlimited supply of shale in that deposit. The overburden here is slightly heavier than at Sparksville, and hydraulic stripping with a Universal nozzle has given good results. A Model G Marion steam shovel is used to load the material into dump cars. This is a softer shale than comes from Sparksville and it is crushed through three roll crushers, all made by the Tamaqua Manufacturing Company. It first goes through a 46 inch double roll type, then through a 32 inch, then through a 24 inch, and finally through a 6 by 50 foot rotary drier which dries the material.

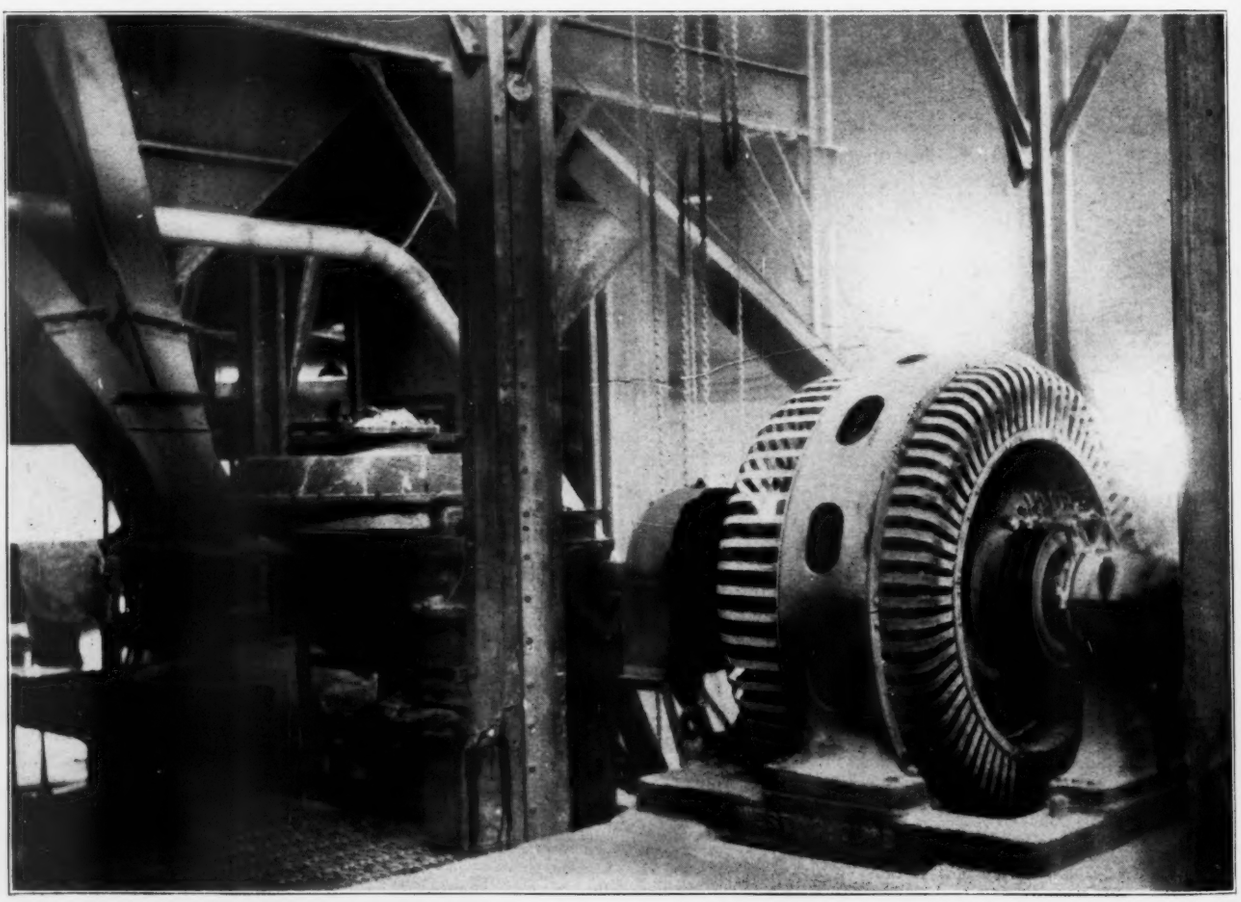
Storage sheds and cars for both shale quarries are roofed so that this material will be delivered to the mill in a dry condition. For supplying steam to the air compressors and drier, two boilers are used, one an Atlas 54 inch by 14 foot, and the other an Erie City 66 inch by 16 foot.

The chemical analysis of the stone and shale is as follows

Limestone	
Silica	1.24
Iron and aluminum	.56
Calcium carbonate	97.03
Magnesium carbonate	1.07
Brownstown shale	
Loss on ignition	6.59
Silica	55.60
Iron and aluminum	30.94
Calcium oxide	.79
Magnesium oxide	2.34
Undetermined	3.74
Sparksville shale	
Loss on ignition	4.24
Silica	68.52
Iron and aluminum	22.08
Calcium oxide	1.23
Magnesium oxide	1.54
Undetermined	2.39

Mill Operations

At the cement mill, the stone and shale are stored separately in a large steel and frame storage house, with a total capacity of 20,000 tons. This storage is divided by two lengthwise partitions, into three



One of the Preliminary Grinding Mills Showing Drive.

compartments, holding 16,000 tons of rock and 2,000 tons each of the two shales. From the bin the material is fed out of the bottom onto belt conveyors which carry it to the crushers.

The stone goes to a 42 inch Jeffrey pulverizer with capacity of 100 tons an hour, which reduces it to one inch size. The shale is mixed by measurement in the shale storage delivery, an equal amount of each being fed by conveyor belt to a 9 foot Style F American Clay and Manufacturing Company dry pan which crushes it to 1 inch size. All crushing machinery is motor driven, operated by individual General Electric motors. The stone and shale, each being kept separate, are then deliverd to 5 by 50 foot F. F. Moser rotary driers. These driers are located at the rear of the kilns and utilize the waste heat from the kilns for the drying process. Five driers are used; three for stone and two for shale.

From the driers the shale and stone is delivered by steel pan conveyors to a Fairbanks hopper scale, where it is weighed, mixed and sent to the Hercules mills. The mixture used is about 80 per cent stone and 20 per cent shale, varying according to the percentage of lime in the stone and the percentage of silica in the shale. However, it never varies more than 5 per cent from this proportion.

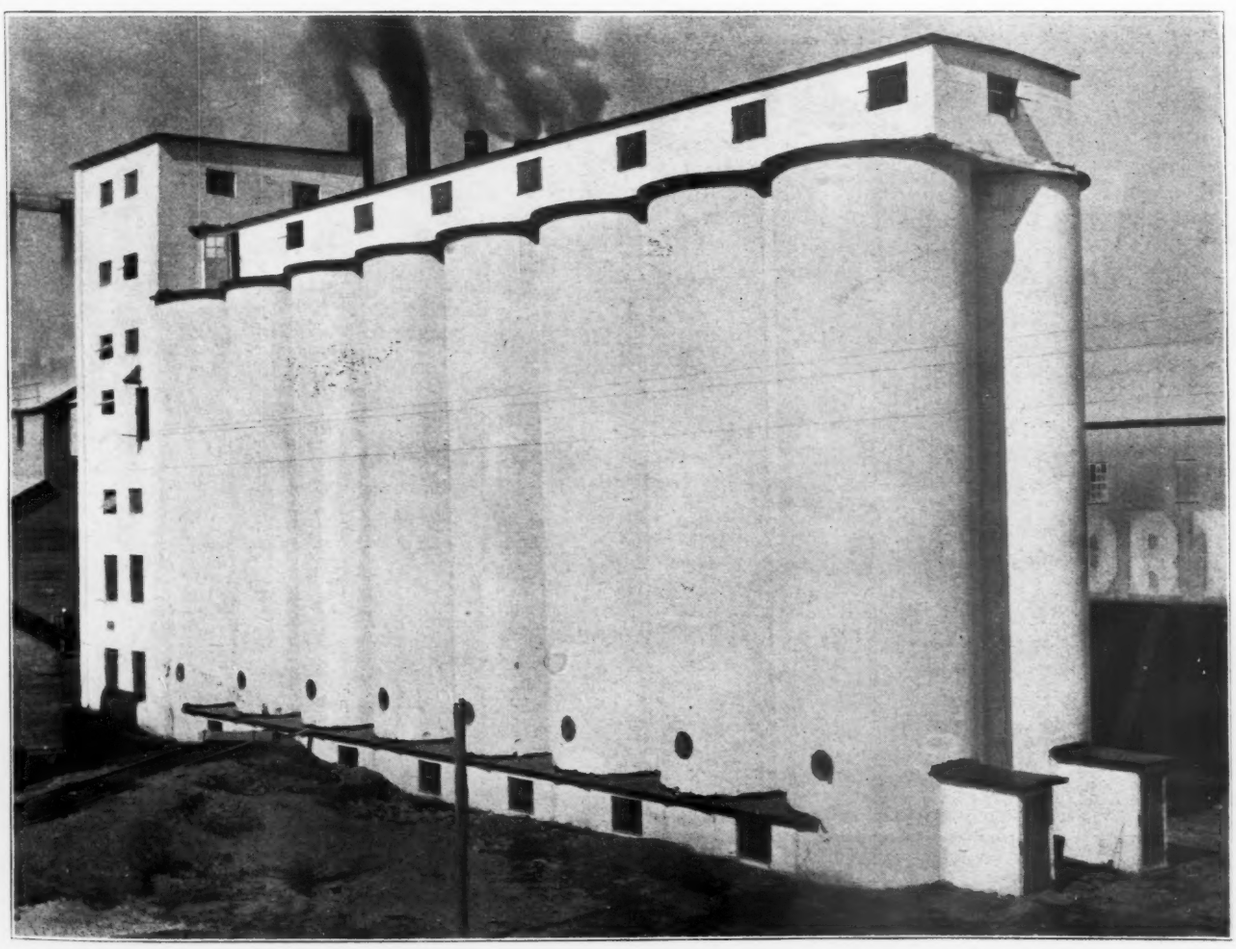
One of the many features of original design in this plant is the conveyor system used to carry the material to the scales. Formerly, belt conveyors were used, but the heat of the material burned the belts so that they had to be replaced every two or three weeks. The belts were replaced with all-metal pan conveyors carrying both stone and shale.

At the hopper scale, the material is dumped directly into enclosed hoppers, stone on one side and shale on the other. A dial records the weight of material in each. When it has received the proper amount by weight, the hopper is hand dumped into a chute leading to the Hercules mills. This weighing is done by an experienced man in accordance with a formula received from the laboratory each day.

Three 66 inch Hercules mills do the preliminary grinding, reducing the material to a semi-fine grade, 60 per cent through a 100 mesh screen. This operation is important, for it has been found by experiment that fine grinding at this stage aids in high early strength in the finished product. The capacity of the Hercules mills is 40 to 50 tons of stone an hour each.

Blending and Final Grinding

From the Hercules mills the material goes to the blending or mixing bins, where it is stored, analyzed and sent to the tube mills. As the material goes into the blending bins it is mixed and



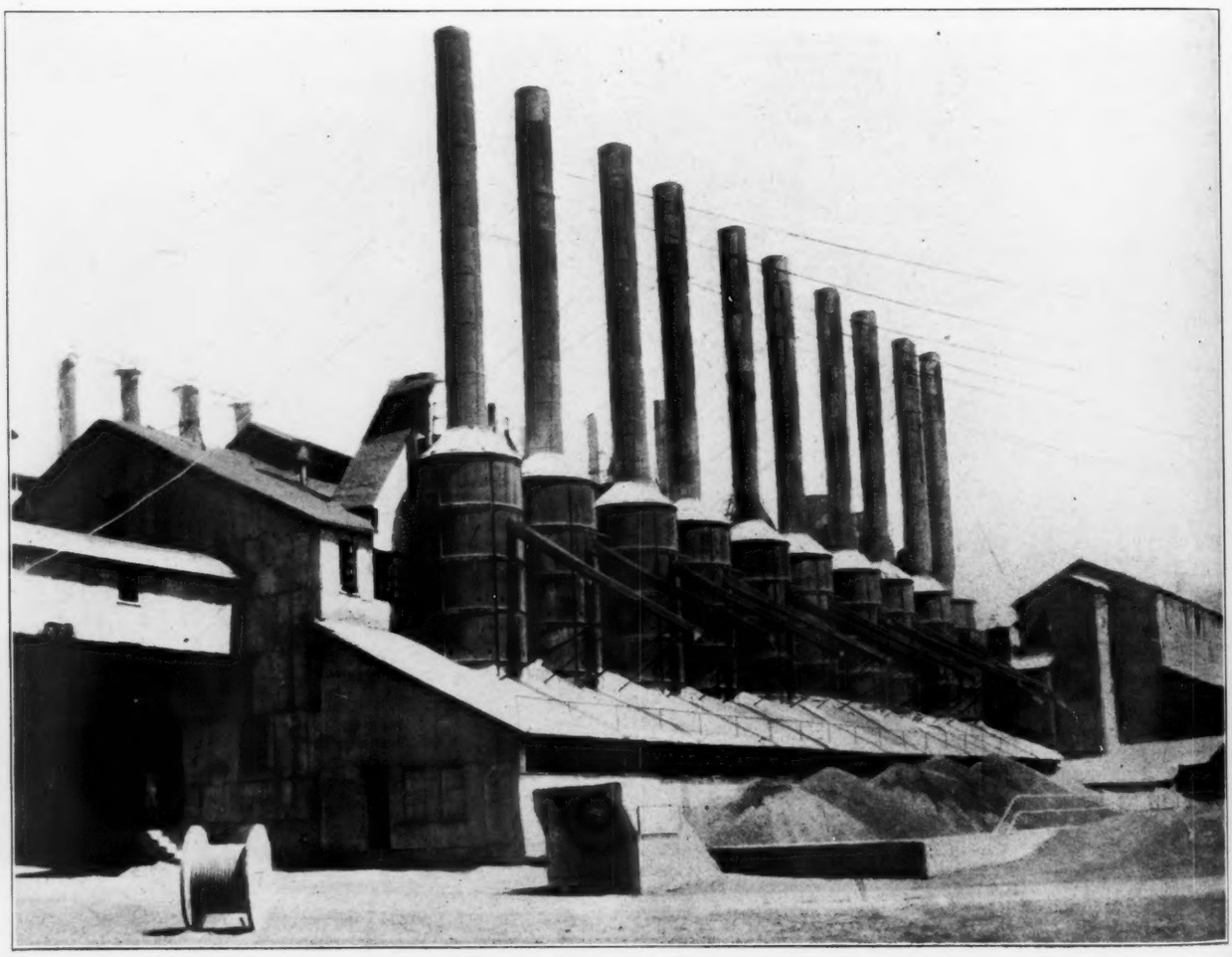
Blending Bins at Lehigh Plant.

One of the Final Tube Mills.

hourly samples are taken for chemical analysis, so that when the bin is full, the exact percentage of lime and silica is known. An underground belt conveyor carries the material from the blending bins to the tube mills. To provide the exact chemical content required for that day's run, certain percentages are fed from the different bins. This is done in accordance with a formula received from the laboratory each day, or more frequently. As the material goes from there to the tube mills it does not vary more than one-half of one per cent from the required formula. There are 16 of these blending bins, built of concrete, 14 feet in diameter and 50 feet high. It takes three hours to fill one of them.

There are eight tube mills, made by F. L. Smidth and Company. They are 5 feet 6 inches by 22 feet, with a capacity of 30 barrels an hour each. The raw material is given the final grinding and is reduced to 85 per cent through a 200 mesh screen. From the tube mills it is carried by a screw conveyor and bucket elevator to a bin that has sufficient storage for a 12 hour run. From the bin it is fed automatically into a battery of ten rotary kilns. Eight of these are of Allis-Chalmers make and two were made by the Vulcan Iron Works. They are 7 feet 6 inches in diameter and 125 feet long.

Heat is supplied by pulverized coal blown into the kilns by 54 inch American Blower pillow block type fans. For this purpose West Virginia coal is used exclusively. It is first dried through two 4 by 30 foot driers made by the F. F. Moser Company, then pulverized in a 42 inch Fuller mill made by the Fuller-Lehigh Company. To avoid possibility of explosions, the coal house is kept perfectly free



Vertical Coolers and Outdoor Clinker Storage Pit.

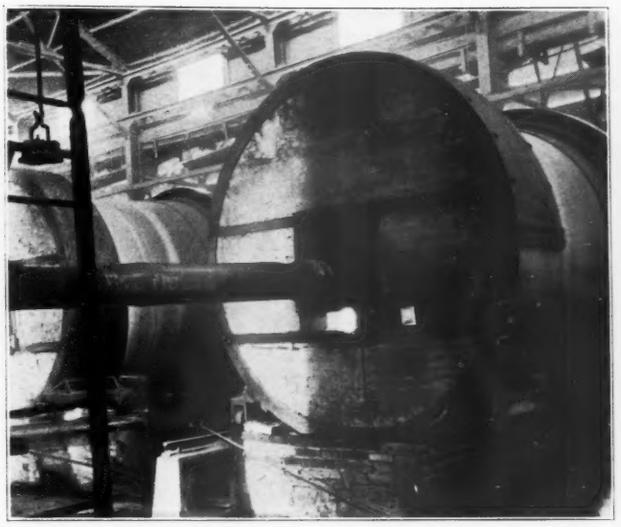
from coal dust. All elevators are enclosed, all the bins have airtight covers, and all machinery where dust is likely to leak is equipped with airtight dust jackets.

In the cement mill, Indiana and West Virginia coal is utilized. For the boilers and steam shovels, Indiana coal is used, and for the kilns, West Virginia. The kilns consume about 300 tons per 24 hour day, and the boilers and steam shovels about 125 tons. These figures do not include the lime plant, nor the shale and limestone quarries.

Clinker Cooling and Storage

From the kilns the clinker is conveyed by bucket elevators to the vertical coolers where it remains approximately five hours, and is cooled with air circulated by 96 inch Sturtevant fans. As an auxiliary cooler and to provide space for disposal of the hot clinker if one of the coolers should be shut down, an outdoor concrete storage pit is available.

From the coolers the clinker is drawn out into a dragline conveyor which delivers it to an automatic rotary scale, another feature of original design. This scale consists of a rotary drum of four compartments with a balance at one end. As one compartment is filled it moves forward a quarter turn, dumping the material onto a belt conveyor, while the next compartment is filling. It also records each movement, thus keeping a record of the amount of material moved. The purpose of this contrivance is to provide an estimate of the amount of production. A small amount of gypsum is added here by hand to regulate the setting time of the finished product.



Front View of One of the Kilns.

From the rotary scale the material is carried through bucket elevators into two 16 by 34 inch Allis Chalmers roll crushers, and there again reduced to one-half inch size and less. From the crushers it is delivered to 30 by 42 inch Griffin mills, made by the Bradley Pulverizer Company. Here the fineness is further reduced to 55 percent

Some of the Preliminary Grinding Mills

through a 100 mesh screen. From the Griffin mills it is delivered in bucket elevators to eight tube mills, the same size, style and design as those used for grinding the raw material. Here it goes through the last process, receiving the final grinding, and is again reduced to 85 percent through a 200 mesh screen.

By bucket elevator and screw conveyor it is carried over to the cement storage house, which is 658 by 125 feet, with a storage capacity of 375,000 barrels.

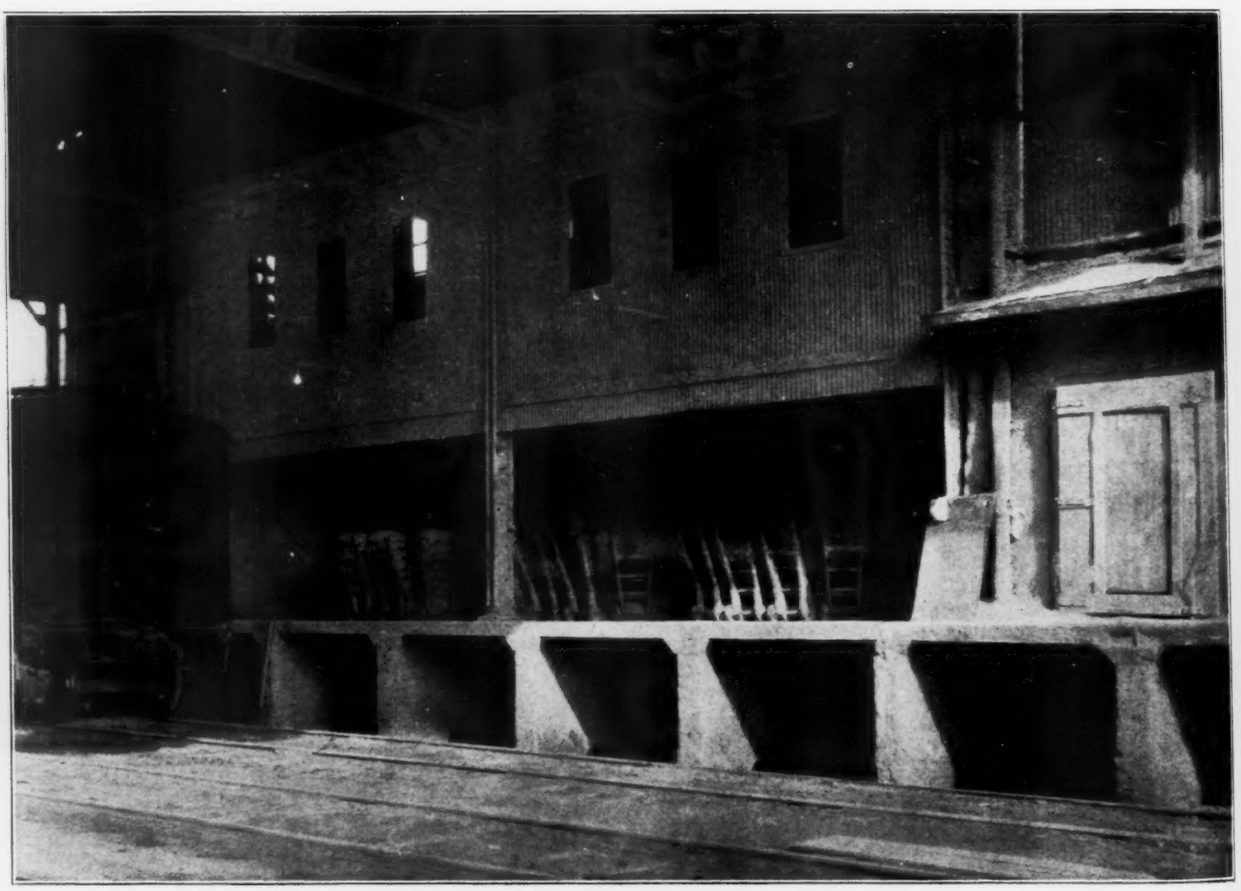
Cement Packing and Handling

The packing department occupies a space 45 by 125 feet in the center of the storage house. From storage it is carried to this department by two 14 inch screw conveyors located in a 10 foot tunnel extending the full length of the storage house. The cement is fed into the main conveyors by 12 inch lateral screw conveyors, located 16 feet from centers, at right angles to the main conveyor. The main screw conveyor feeds into a bucket elevator that carries the cement to bins in the packing department, and these feed into six four-tube Bates packers, driven by 20 h.p. direct connected General Electric motors. From the packers the bags of cement are trucked into car or truck on ball bearing type hand trucks. Besides the Bates packers a dust collecting system is located in this department.

The conveyor system for transferring the cement from the stock house to the packers is another feature of original design. Before this installation, about six years ago, the cement was shoveled by hand. There was no dust collector in use then, and much dust was raised by the hand shovelers. With this installation the dust is carried off and the work of moving the cement is done more quickly and more economically. The lateral screw conveyors are operated individually by a 10 h.p. General Electric motor mounted on a truck. There are eight of these, four on each end of the building. These motors are equipped with plugs to connect with the current in an overhead power line.

Dust Settling Equipment

One of the pleasing features of this plant from a sanitary and health standpoint is the dust collecting and ventilating system. Dust is collected from each machine where it is present in any appreciable quantity, through pipes hooking into enclosures and drawn into the central separating room, where it is filtered out and the clean air released. In the packing department and cement storage house, two systems are used, each a 17 foot dust arrester made by the W. W. Sly Manufacturing Company at Cleveland. Around the Her-



View of Shipping Platform Showing the Bag Packers.

cules mills, the raw department and other points where dust is present in large quantities, it is collected by a system manufactured by the Northern Blower Company.

In the Sly system, two four foot blowers are direct connected to a 15 h.p. motor. It uses a 5 foot fan made by the Garden City Fan Company. The Northern Blower system consists of 18 cylinders containing 12 bags each, which are operated by air vibrators. Two 9 inch conveyors, 40 feet long, carry the dust that has been separated, into an elevator. This system is operated by one double 55 inch fan, direct connected to a 60 h.p. motor.

Baghouse and Boiler Room

The bag department adjoins the packing department. Here all bags are returned and checked in, sorted, cleaned, repaired and stored. As in other cement plants, paper bags are becoming increasingly popular, especially among the dealers. During the early part of the year the dealer demand is relatively heavy and about 50 to 60 per cent of the output is sold in paper bags, the yearly average being about 40 per cent. Contractors and state highway officials, however, continue to use cotton bags very largely because they do not burst so easily and less waste occurs under rough handling.

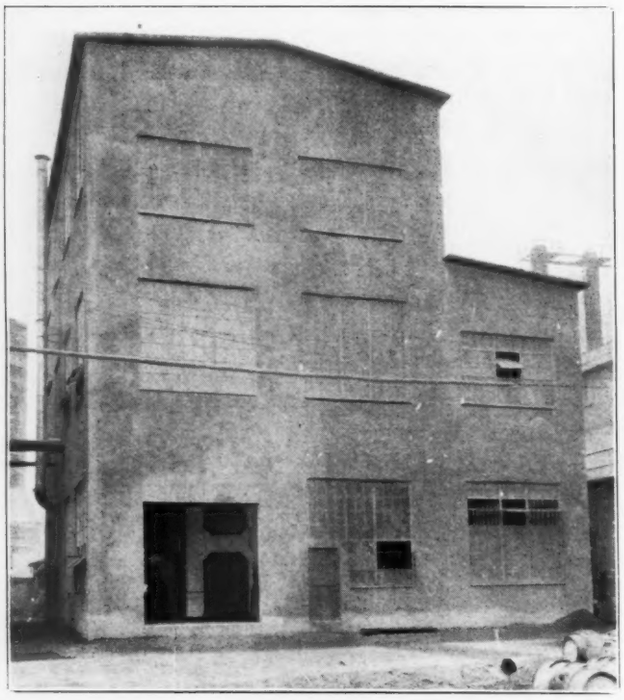
In the boiler room, which is 47 by 163 feet, steam is generated by a battery of ten Sterling boilers, built by the Babcock & Wilcox Company, with a h.p. rating of 325 each, but with an actual performance of considerably more horse power. Fuel for the boilers is supplied by automatic chain grate stokers, manufactured by the Greene Engineering Company. They are 7 feet 6 inches wide by 9 feet 10 inches long. Water is supplied to the boilers by two Worthington centrifugal pumps, one a 12 by 10¼ by 15 inch outside packed plunger pump and the other a 17 by 10¼ by 15 inch outside packed plunger pump.

A unique method is used for handling fuel to and from the boiler room and for disposing of ashes and cinders. The coal, received in large steel gondola cars, is placed on a trestle where it is unloaded and stored. Underneath the coal pile there is a concrete tunnel through which a 750 foot conveyor belt carries the coal up an incline and discharges it into steel hoppers above the stokers, which feed by gravity to the grates.

The ashes and cinders fall into a pit below the stokers, from where they are raked into a one-ton end-dump steel car. When filled, the car is pulled by cable up an inclined track where it is dumped automatically by a trip into a steel bin, from which it is loaded into railroad cars and disposed of.

Boiler efficiency is recorded by keeping a correct weight of the coal and water used by the boilers, and by recording the amount of steam that comes

Method of Ash and Cinder Disposal with Coal Conveyor in Background



Exterior of Power House.

from the boilers. This instrument is located in the power house.

Power Houses and Equipment

One of the newest features of this plant is the equipment in the new power houses which went into service, along with the other recent installation of new machinery.

Power house No. 1 is a concrete building, 151 feet long and 86 feet wide, in which is located most of the power machinery for driving the machines in the mill. This consists of the following equipment: One 28 by 56 by 48 cross-compound Corliss engine that furnishes power for driving the eight F. L. Smidth tube mills in the raw department; one 28 by 44 by 48 cross-compound Corliss engine which furnishes power for the Allis-Chalmers roll crushers, the Bradley griffin mills and the clinker grinding department; one 28 by 44 by 48 cross-compound Corliss engine which furnishes power for the eight F. L. Smidth tube mills in the cement finishing department; one 20 by 40 by 42 cross-compound Corliss engine, direct connected to a 481 ampere General Electric generator. These engines were all manufactured by the St. Louis Iron and Machinery Company. Also, one 27 by 54 by 36 McIntosh & Seymour cross-compound engine, direct connected with a 1,000 kw. General Electric generator; one 14¼ by 22¼ by 16 inch two-stage air compressor, manufactured by the Ingersoll Sargent Drill Company, to furnish compressed air for general purposes throughout the mill.

Power house No. 2, the most recent addition, is housed in a steel and gunite building, 55 by 62 feet, in which was recently installed a 2,500 kw. turbo generator, manufactured by the General Electric Company, together with condenser and auxiliaries, manufactured by the Westinghouse Electric Company. This new installation was made necessary to furnish power for three 350 h.p. General Electric motors recently installed in connection with the Hercules mills, which are direct connected to the motors. This building has been designed for the installation of a second unit which will furnish power for all belt driven machinery and for additional motors that are being installed throughout the plant. One side of the building is of temporary

Interior of Machine Shop.

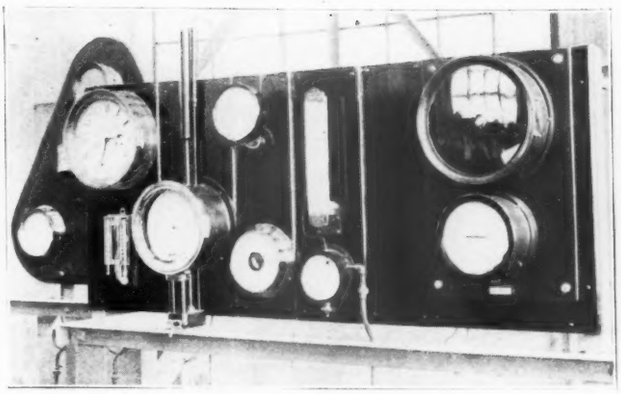
steel construction and space has been left there for a new addition to house the second unit.

This power house, designed and equipped by the General Electric Company, is the last word in mechanical efficiency. It is automatic throughout, with instruments which record various activities of the plant. All the attention it requires is the time of one man to watch and keep a record of the instruments. Watt hour meters are located on the switchboard, from which anything wrong in any part of the plant can be detected.

In the old power house, the engines are connected to a 36 inch barometric condenser, manufactured by Henry R. Williams and Company, with three 16 inch centrifugal pumps, circulating water through two cooling towers. Two of the pumps are in constant use and the other is held idle for emergency. The water and steam which has been used in various processes throughout the plant is cooled and condensed in the cooling towers and prepared for use again. These cooling towers are large steel drums filled with 6 inch tile. They have a total height of 90 feet. The bottom sections are 24 feet in diameter and 20 feet high, and the top section of 70 feet is 16 feet in diameter. Additional cooling capacity is provided by the spray pond which was finished and placed in service April 23, 1928.

The water supply for the plant comes from a cave two and a half miles east of Mitchell. It is connected to the mill by a 10 inch cast iron water main. The water is pumped by two 4-stage Allis-Chalmers centrifugal pumps, located in a pump house at the cave, with starting compensators in the power house and the indicating instruments in the power house to show what the pumps are doing.

For handling material such as coal, throughout the plant and yard, two Orton & Steinbrenner revolving steam cranes, mounted on caterpillar truck, with one-yard dippers are used. They have a lifting capacity up to 14,000 pounds.

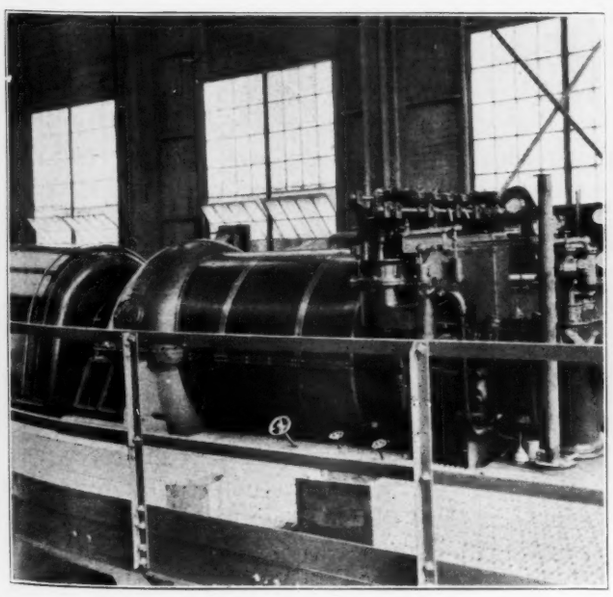


Instrument Board in Power House.

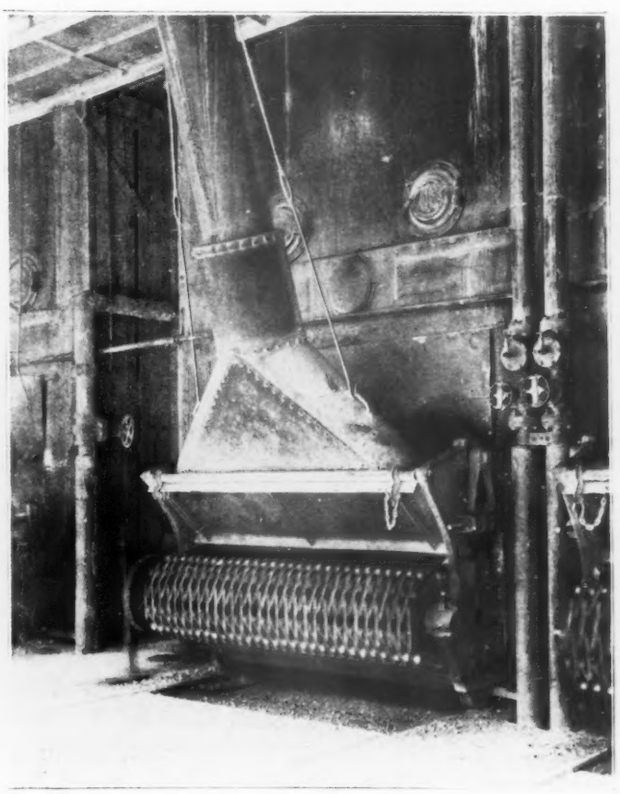
Miscellaneous Shops

The plant maintains a thoroughly equipped machine shop, blacksmith shop, plate shop and woodworking department, conveniently adjacent to other departments.

The machine shop, which employs about 10 skilled machinists, is housed in a 50 by 160 foot concrete building. It is equipped with five lathes: One 17 inch by 8 foot Greaves & Klusman, one 20 inch by 13 foot Blaisdell, one 24 inch by 16 foot Lodge & Shipley, one 21 inch by 14 foot LeBlond heavy duty, one 36 inch by 20 foot Draper. Other equipment includes: One 34 inch by 8 foot drill press made by the New Hayden Manufacturing



The 2500 KW Turbo Generator.



One of the Automatic Chain Grate Stokers.

Company; one 22 inch by 6 foot 9 inch upright drill made by the W. F. & J. Barnes Company; one No. 1 radial drill with capacity up to a two inch hole; one 20 inch J. Steptoe & Company shaper; one 4 foot boring and turning mill with double head, made by H. Bickford; one 20 inch circle saw manufactured by John I. Burr & Sons; one 14 inch Hewes & Phillips slotter circle saw; one electric welder made by the Lincoln Electric Company.

The blacksmith shop, which is housed in an adjoining 40 by 90 foot concrete building, regularly employs four men. It is equipped with four forges, one babbiting oven and one heating and annealing oven; also one 1,100 pound single frame steam hammer manufactured by the Niles Bement Pond Company. Blacksmith coal is used in the forges and air is furnished by a No. 4 blower, manufactured by the Buffalo Forge Company, driven by a 5 h.p. motor.

The plate shop, also housed in an adjoining concrete building 130 by 50 feet, employs eight men. It is used for boiler work, also car and locomotive repairing. The equipment includes the following: Two upright square base drill presses made by the W. F. & J. Barnes Company, one 20 inch, the other 26 inch; one 24 inch throat punch and shear manufactured by the Cleveland Punch and Shear Company; an emery wheel stand with wheel capacity of 3 by 18 inch wheels made by the Champion Blower and Wheel Company; one No. 3A combination punch and shear press manufactured by the Royersford Foundry and Machine Company; one set of 8 foot rolls manufactured by the Scully Steel and Iron Company.

The woodworking department is equipped with a 36 inch No. 50 Fay & Egan improved band saw; one 16 inch jointer made by the Crescent Machine Company; and one 24 inch planer made by the Crescent Machine Company, besides the usual hand woodworking tools. For carrying spare parts, tools, etc., the stores department is housed in a 51 by 142 foot concrete building near the machine and blacksmith shops.

The laboratory is in a 40 by 40 foot frame building near the office. It is a complete chemical and physical laboratory, in which all raw materials and the finished product are tested. All screens used in this laboratory are hand shaken, because it is believed that the use of this equipment tends to greater accuracy than with the use of automatic screens. This laboratory, besides testing the product of the Lehigh cement mill, also takes care of the raw materials and finished products of the Lehigh Lime Company, a subsidiary which was described in the August 29, 1928, issue of Pit and Quarry. Eight men are employed, working in three shifts.

The output is merchandised very largely through dealers, in accordance with the policy of the company, which is to build up distribution through the dealers. About 80 per cent of the product is sold through this channel, the other 20 per cent going to state and county highway officials.

Sales are made mostly in carload lots to dealers. An average of about two carloads a week of bulk cement is shipped, and the company is prepared to load it in bulk for customers who want it delivered that way. About 20 per cent of the total product is used for road building, the balance being utilized for general building purposes. It is extensively used in this territory for the building of foundations and for farm buildings in the more prosperous rural sections. In this connection, bulletins issued by the Portland Cement Association are used as promotional literature, and these have brought very good results.

Less than five per cent of the product is sold in trucks. Most of it is shipped via the Monon and the Baltimore and Ohio railroads, which intersect at Mitchell.

Aside from personal work and keeping in touch with local outlets, such as road and building contractors and highway officials, no individual advertising is done by this plant, all advertising being handled by the Lehigh Company from the home office in Allentown, Pa., and covering the output of the 20 mills of that company.

The safety record of this plant is one in which the employes, from the general superintendent down to the day laborers, take special pride. It is the best of any cement mill in the country. In 1923, the first year the Portland Cement Association inaugurated the safety prize, this plant took second place. In 1924 it was awarded first prize. In 1925 a B. & O. switch engine ran down and killed a day laborer, which eliminated the plant from the contest that year. In 1926 it again took first place. And in 1927 it was given second, and would have won first place again, except for the fact that after the quitting whistle had blown one day, a car driven by an employe hit one of the men who was on his way home and wrenched his knee. The outstanding feature of this record is the fact that the plant was awarded first place twice in five years, a record that no other cement mill in the Portland Cement Association has duplicated.

The new machinery and equipment was purchased and installed, and the overhauling work done under the management and direction of D. E. Ritter, vice president and general manager, and R. R. Bear, vice president and chief engineer, of the home office of the company at Allentown, Pennsylvania. W. H. Weitknecht is superintendent and H. H. Purkhiser is master mechanic of the Mitchell plant.

NEW TESTING LABORATORY
of the
NATIONAL CRUSHED STONE ASSOCIATION

IN recognition of the fact that research has become a vital activity of their industry the producers of crushed stone have initiated a program of investigation and have provided their national organization with the necessary facilities for research work. It is not within the scope of the present article to discuss the researches to be conducted but rather to give some idea of the testing equipment now available at the headquarters of the National Crushed Stone Association in Washington.

Up to July, 1928, the offices of the Association were located in the heart of the business section of Washington. When, however, it was decided to establish a testing laboratory and add research to the other functions, it became necessary to seek additional floor space and it at once became evident, that to conserve time and to use the personnel of the Association to the best advantage, it would be necessary to have the offices and laboratory located in the same building. Fortunately, the required space was discovered in the Merchandise Building, located at 14th and S Streets, N. W., only a ten-minute ride from the central business section of Washington.

Laboratory Equipment

The laboratory equipment at the present time includes facilities for screening large size samples and also their reduction by crushing and grinding, down to the size of stone, sand or dust, equipment for concrete testing, including compression, transverse, tension and freezing tests of concrete and also full equipment for the physical testing of stone. This apparatus is housed in three rooms, two in the basement where the noisy and dusty portion of the work is done and one on the second floor of the Merchandise Building. These rooms occupy 2110 square feet of floor space and in addition there is storage capacity for the temporary storage of samples amounting to 1050 square feet. The moist room in the basement for concrete specimen storage is 17 feet by 18½ feet with an area of 315 square feet. A total of 3,475 square feet of space is thus devoted to laboratory work and in addition there is office space of 1,083 square feet or 4,558 square feet in all.

Equipment for Physical Tests on Stone

The equipment for the physical testing of stone is located on the second floor. For the preparation of specimens to be used in the impact test for toughness and in the Dorry hardness test, a diamond core drill, a diamond saw and a grinding lap

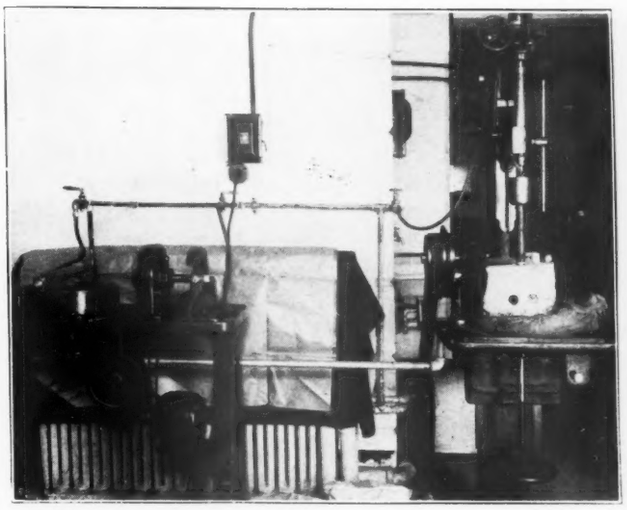


Figure 1

are used. All three of these machines are shown in Figure 1. The impact machine for making standard toughness tests on rock, the Dorry hardness machine for determining the so-called hardness coefficient and the Deval abrasion machine used for determining the percentage of wear, or, as it is sometimes expressed, the French coefficient

$$\left(\frac{40}{\text{per cent of wear}}\right)$$

are all shown in Figure 2. This equipment has been checked to see that it complies in all respects with the standard requirements for the respective tests. Each machine is independently motor driven and all of the electrical controls have been worked out with the idea in mind of ease of operation and convenience.

For conducting laboratory screen tests a Tyler Ro-Tap sieving machine has been installed provided with square opening sieves arranged in sizes from the No. 200 mesh up to 1 inch. Sizes larger than 1 inch are used with screens 18 inches in diameter for hand-shaking. This equipment was supplied by the W. S. Tyler Company. The Ro-Tap screen is housed in a celotex lined cabinet to reduce the noise and dust to a minimum. This cabinet is seen in the left corner of Figure 2.

In addition, a set of screen plates having circular openings ⅛, ¼, ⅜, ½, ⅝, ¾, 1, 1¼, 1½, 1¾, 2, 2½ and 3 inches were supplied by the Hendrick Manufacturing Company. They have been fitted in rectangular wood frames which are installed in nestable form in a rocking cradle. The laboratory is thus provided with apparatus for making both square and round opening screen tests.

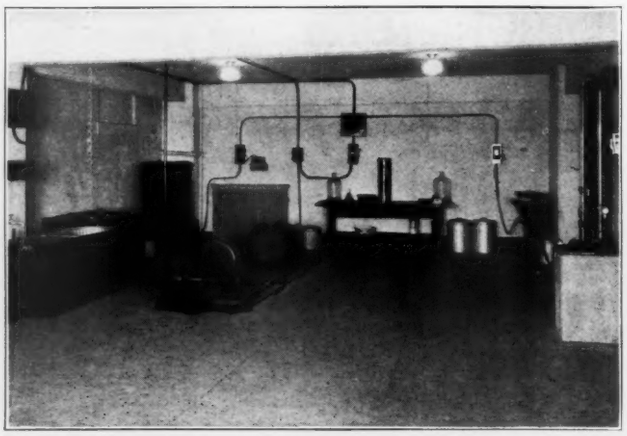


Figure 2

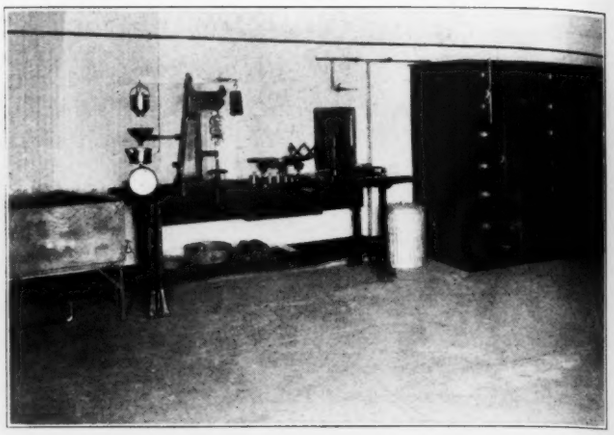


Figure 3

Cement and Mortar Testing Equipment

The cement and mortar testing equipment for the routine testing of cement, sand and other fine aggregates used in the investigations possesses several unique features. The equipment thus far includes a cement mixing table having a plate glass top for the mixing operations, a 1,000 pound Riehle cement tester, the necessary briquet molds to which there will later be added small cylinder molds, a boiling apparatus, Vicat apparatus for determining normal consistency and time of set, measuring burettes of various capacities, including a special burette used at the mixing table, a Le Chatelier apparatus for determining specific gravity and a storage cabinet which combines a moist closet for the initial storage of briquets and storage tanks for long time storage under water.

This storage cabinet is unique in its combination of the two functions of 24 hour moist air curing and long time water storage. It was designed in the Bureau of Engineering of the Association and is made of asbestos lumber, moisture proofed with a new type of waterproofing compound developed by Dr. E. C. E. Lord of the U. S. Bureau of Public Roads. All of this equipment is shown in Figure 3 and a more detailed view of the storage cabinet is shown in Figure 4. In the extreme upper left corner there will be noted a spray which insures a constantly moist atmosphere of uniform temperature in the upper compartment of the cabinet which is used as a moist closet for the storage of cement briquets immediately after molding. The briquet molds will be noted on the racks supported on the upper immersion tank and there will also be noted the two additional immersion tanks filled with water. The upper tank overflows into the middle, and the middle tank into the lower one. The water entering the cabinet through the spray is controlled to a temperature of 70 deg. F. by the use of a Powers regulator valve which operates thermostatically. This cabinet gives every promise of being a complete success and gives constant temperature and moisture conditions which are so desirable in testing cements and mortars. A chemical balance donated by the Taylor-Wharton Iron and Steel Company completes the cement testing equipment.

Concrete Testing

Concrete specimens are being tested for strength in three ways, in compression, tension and as beams. The testing machine shown in Figure 5 is of a comparatively new design which, however, employs a well established type of weighing mechanism. It is made by the Southwark-Emery Company of Philadelphia and is of 300,000 pound capacity in compression and bending and 60,000 pounds capacity in tension. The load is applied hydraulically by means of a Hele-Shaw electrically driven pump. The weighing system of the machine is very sensitive. Dependence is not placed on the measurement of the pressure in the hydraulic ram but the entire system of weighing is independent of the load applying system. Any load applied by the machine is transmitted through the pulling screws to a very sensitive hydraulic sack and in turn the pressure created within the sack is transmitted to the weighing gages. The entire load weighing mechanism was calibrated while mounted on the machine and through the cooperation of the U. S. Bureau of Standards periodic calibrations were made to determine the constancy of calibration of this most important piece of equipment. A Whittemore-Petrenko calibrating ring was used for this purpose and the work was done by Capt. S. N. Petrenko of the Bureau of Standards. Our fortunate situation in Washington makes this assistance from the Bureau of Standards feasible.

Special tools have been devised in the engineering bureau for use in making tension tests on concrete and also beam tests. Every effort is being made to eliminate the errors in beam testing which have resulted elsewhere through the neglect of certain principles which should not be overlooked, among which may be mentioned the prevention of

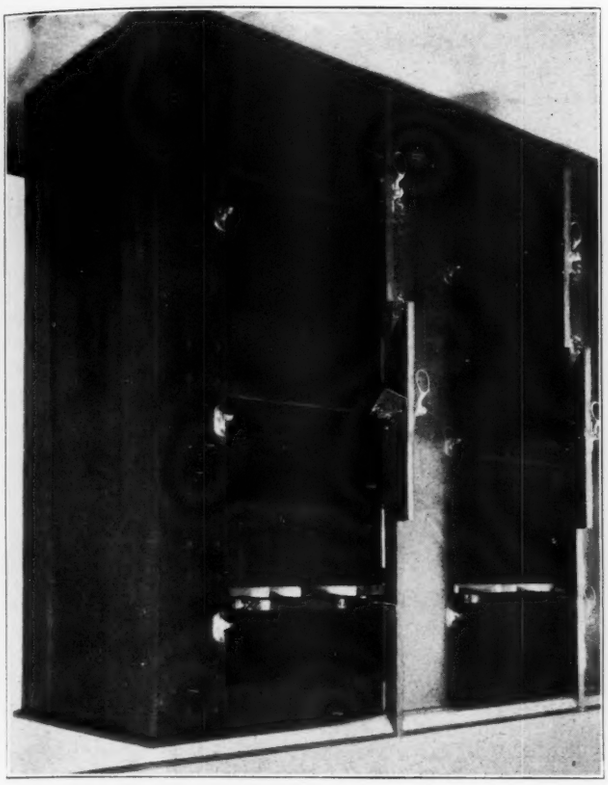


Figure 4

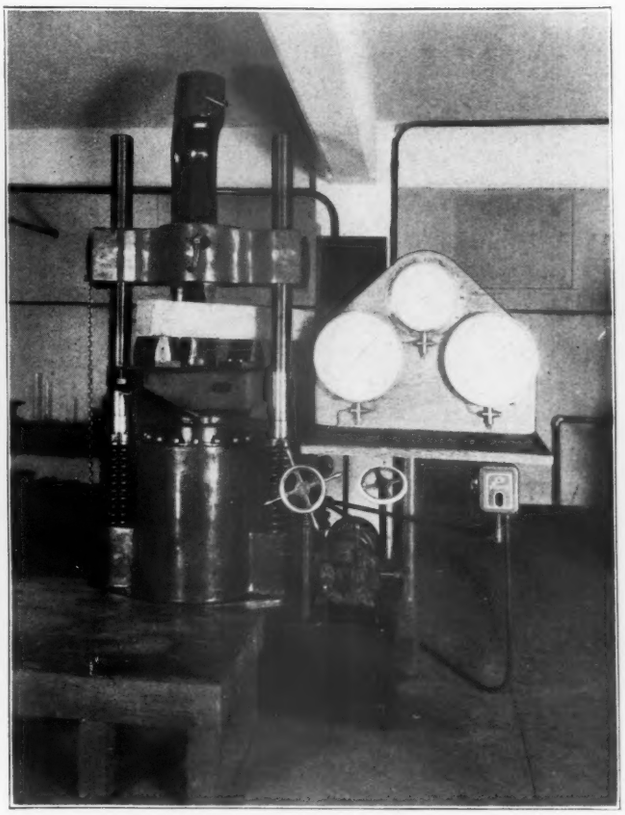


Figure 5

eccentricity of loading and the avoidance of horizontal components of reaction due to the restraint of the reaction blocks. This transverse testing equipment will be described in detail elsewhere. It is seen mounted on the testing machine in Figure 5.

Freezing Tests on Concrete

One very important kind of test to be made on concrete and concrete aggregates is one which will determine the durability of these materials. It is becoming recognized more and more that the durability of concrete, or its resistance to the action of the weather, is one of its most important attributes. Often the soundness of the coarse aggregates has been called into question and consequently it becomes necessary that means be at hand for making investigations on the resistance to freezing and thawing of both concrete and concrete aggregates. For this purpose there has been installed a six compartment Frigidaire ice cream cabinet which has been provided with a water cooled compressor driven by a one-half h.p. motor. This is a somewhat heavier compressor than is ordinarily used with this type of equipment.

The specimens as will be seen in Figure 6 are placed in galvanized cans which are filled with water. These cans in turn are partially immersed in alcohol which is placed in the openings provided in the cabinet. The alcohol serves as a medium for the rapid conduction of heat away from the specimens to the brine circulating within the cabinet and by the use of this device it is possible to effect very rapid freezing of the concrete specimens. A temperature of 20 deg. below zero may be attained and it is possible to conduct three alternations of freezing and thawing per day.

After each freezing the galvanized cans containing the frozen specimens are removed from the cabinet and are placed in a hot water tank which is seen immediately adjacent to the cabinet. Hot water is provided from the hot water tap and the specimens are thawed within a few hours. The soundness of rock may be very readily ascertained with this apparatus and, moreover, by its use comparisons may be made with the various accelerated tests for the soundness of rock.

Screening of Coarse and Fine Aggregates

Twenty or thirty of the samples required for one of our investigations are quite large and involve approximately 25 cubic feet of material. Each of these samples must be screened to given sizes and consequently it was necessary to install mechanical equipment for this purpose. The type of screen finally decided upon was a small size Hummer made by the W. S. Tyler Co. Screen plates have been provided extending from No. 80 to 2½ inches in size including Nos. 80, 50, 20, 10 and 4 and ⅜, ½, ¾, 1, 1¼, 1½, 1¾, 2, and 2½ inch. This equipment is shown in Figure 7 in the rear of which will be seen the racks supporting the extra screen plates. This apparatus has been found to be satisfactory for our purpose, particularly on the smaller sizes. In this figure will also be seen a gas drying oven used for the drying of small size samples and

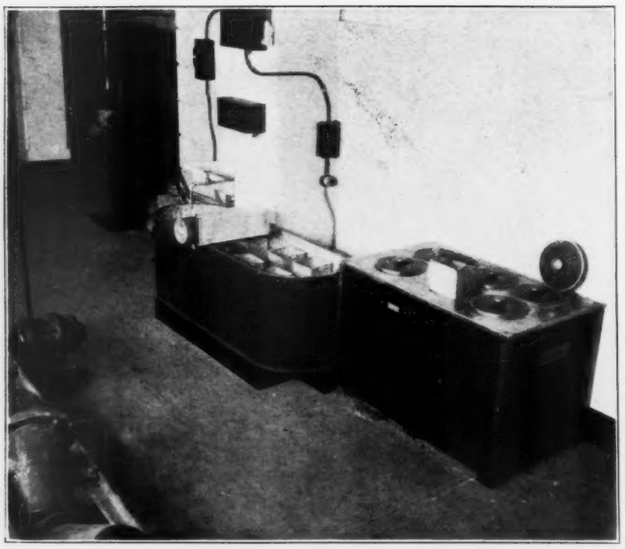


Figure 6

also a standard water heating system for the provision of hot water wherever needed in the laboratory.

The Allis-Chalmers Manufacturing Company of Milwaukee supplied the Allis-Chalmers grinder which crushes material from ½ inch down to 10 mesh and finer. This grinder is seen in the picture at the extreme left. There will also be seen a small Traylor gyratory crusher which has proven very useful for reduction of stone to small sizes approximately ⅝ inch and smaller in diameter.

Molded Concrete Specimens

In Figure 8 are shown the various pieces of apparatus used in the molding of concrete specimens. There will be seen 6x6x36 inch beam molds constructed after our own design, employing steel channel sections, 6x12 inch cylinder molds for use in compression and tension tests, a flow table for determining the consistency of concrete and a slump cone for the same purpose, the necessary platform scales graduated to 1/10 of a pound for weighing out the various batches of materials, a

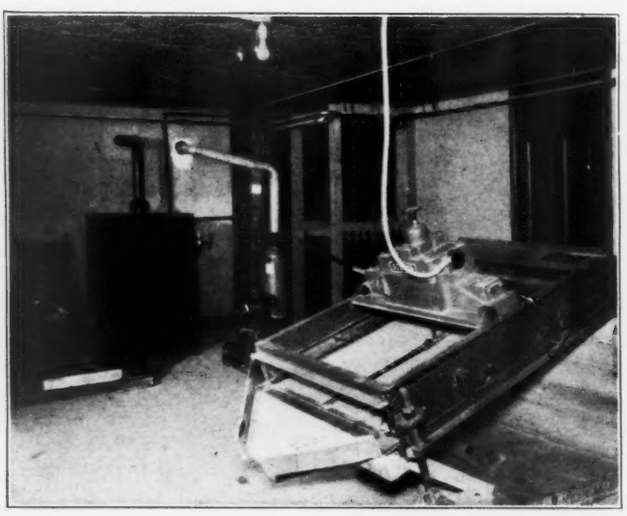


Figure 7

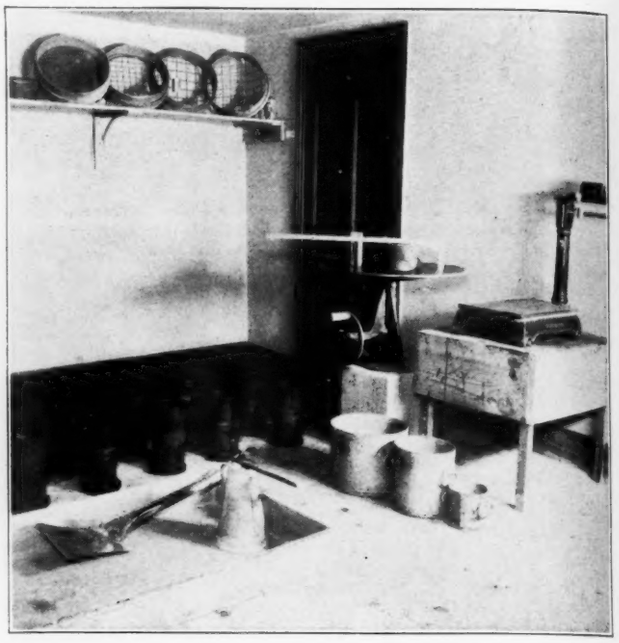


Figure 8

galvanized mixing pan and other tools required in this work.

Concrete Moist Room

The specimens are removed from the forms a day after molding and are conveyed by means of a rubber tired truck to the moist room which is seen in Figure 9. Fortunately, it was possible to select a room for this purpose which is almost ideal. It is in the basement where the temperature remains quite constant. It is an interior room surrounded by thick brick walls and it was merely necessary to waterproof it to transform it into a moist room for the storage of the concrete specimens. Provision has been made to use four mine sprayers and the type finally selected is that of the American Moistening Company having a No. 030 orifice. Compressed air is not used in connection with these sprayers as it does not seem to be necessary. Minute particles of water are floating continuously

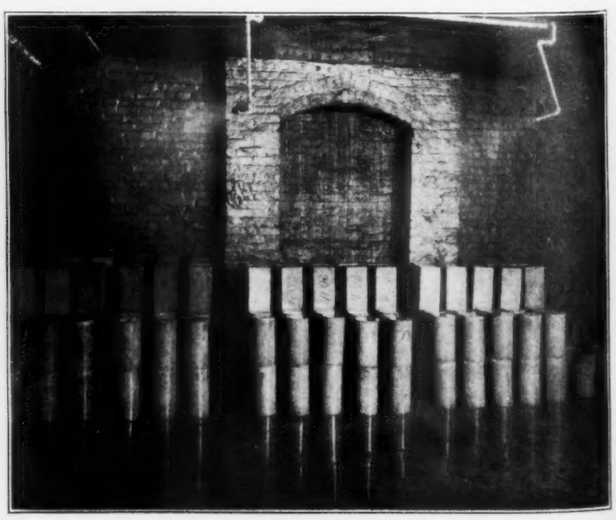


Figure 9

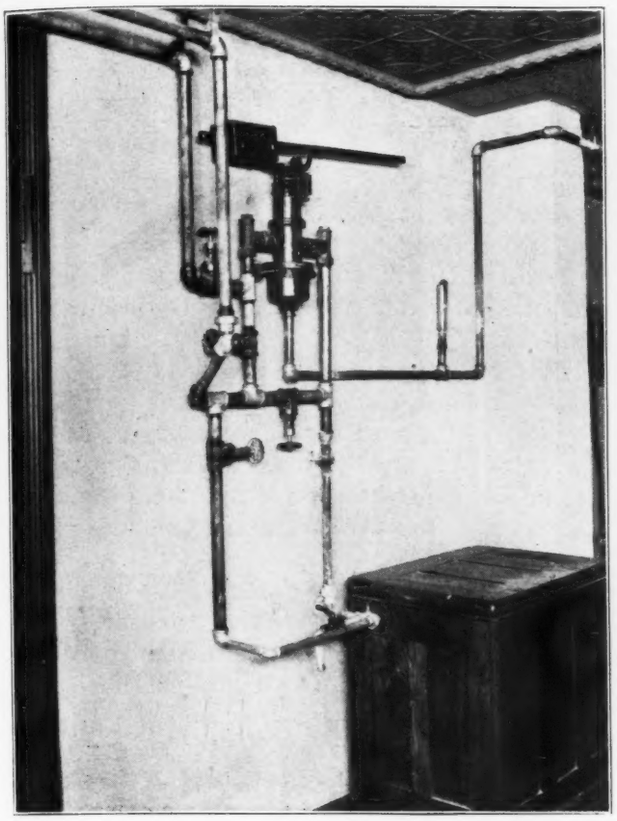


Figure 10

in the atmosphere of the room and the specimens are receiving ideal curing. The water which supplied these sprays is first regulated in temperature by means of the Powers regulator valve shown in Figure 10. Hot water enters one side of this valve and cold water the other and by means of thermostatic control the desired temperature of 70 deg. F. is obtained. The same valve regulates the temperature of the water supplied to the moist cabinet and storage tanks for cement testing previously described.

One very important feature of the laboratory is ample space for the storage of materials and in figure 11 will be seen a small portion of the samples which have been received and which have been screened to the desired sizes awaiting their use in concrete.

Certain problems are of pressing importance and the equipment which has been purchased is that necessary to undertake these particular problems. As other investigations become important additional equipment will have to be added. It has been the aim to obtain apparatus which is not only convenient and speedy of operation but which will give trustworthy results. Research is as practical a matter as the routine production of crushed stone. A high standard of accuracy will be maintained but it is not proposed to carry that accuracy to a meticulous extreme out of all proportion to the character of tests involved. It will be the aim of

Figure 11

the laboratory to obtain practical results which will be useful and valuable in solving some of the problems in aggregates with which engineers and producers are now concerned.

Cash Costs of Carelessness

The annual economic cost of accidents in the United States, measured in cold dollars and cents, would float a fair-sized war. To be more specific, accidents cost the American people $3,200,000,000 annually.

This figure is a conservative estimate made by the National Safety Council from a study of the best available sources, during recent months.

Three billion, two hundred million dollars! And that figure is cash only. You can't measure the cost in tears, human suffering or broken homes. There isn't money enough in the world to compensate with that yard stick.

The cost of carelessness can be summed up about as follows:

During 1927 there were approximately 95,500 fatal accidents, and 10,000,000 non-fatal injuries.

Industrial accidents alone cost 320,000,000 working days. (Fatalities and permanent injuries are included in this figure.)

Each worker in the country loses an average of seven working days from sickness each year.

The economic loss from sickness and premature death among wage earners is estimated at $1,500,000,000. And that's something else to think about!

SAFETY AND LABOR RELATIONS

By J. M. Larkin

Assistant to the President, Bethlehem Steel Company, Bethlehem, Pa.*

I HAVE been asked to speak on the subject of safety and labor relations. Obviously such a broad topic cannot be adequately discussed in the short time at my disposal. I will therefore attempt to emphasize one phase of this subject which I believe has particular bearing in helping us to see in a new light the important economic position which good safety and good labor relations have come to have in business. I refer particularly to the necessity of doing everything we can to assure to workers steady jobs, in order that their living standards may be protected or even improved and their buying and saving power uninterrupted in the best interests of the community at large.

At the outset let me say that in no other country and during no other era have safety and labor conditions been as sound and wholesome as in America today. Greater emphasis is being placed on safety and accident prevention work than ever before. The results of these efforts are that industry is today a safer place in which to work; workers, collectively and individually, are more cognizant of the safety factor in their daily occupations. Furthermore they have come to realize the economic importance to themselves and to their company in avoiding accidents.

Such results as these are possible only because of the fundamental improvement which has been brought about in labor relations generally. Cooperation in industrial relations as a whole has brought with it a greater measure of cooperation in direct safety efforts. The economic side of safety has become a factor of greater consideration without disturbing the interest in accident prevention from a humanitarian standpoint.

There is generally a better thinking on the part of workers themselves. They have come to have an enlarged viewpoint toward each other and industry, they are less provincial and are seriously concerned about the prosperity of business as a whole because they realize their stake in it. This is due largely to the enlightened educational work that has been done by industry in imparting freely to the labor force facts about the conditions of the business, to the generally sound policy of public relations we find in industry today, and to the larger participation workers have come to have in their companies and the better things in life.

I think I may safely say that workers have come to realize that their own interests are best served by having others prosper. After all this is but a part of the general trend of the times which is exemplified by a changed thought among business leaders themselves. They have ceased to take a certain quiet consolation in the fact that their own particular company is better off than the other fellow's and have come to realize and appreciate that the troubles of another industry are their own troubles.

This healthy situation which exists generally among business leaders and in labor circles is indeed one of the most hopeful signs for an enduring period of amicable industrial relations and the safety movement because of its unselfish aims has played an important part in bringing about these desirable conditions.

We find today that even in spite of the immigration restrictions and in spite of a reasonably high level of productivity, there is actually an ample supply of labor. Moreover the efficiency with which industry is being carried on today has made it possible to release from the old to the new industries an ample supply of labor. This efficiency has been brought about largely through the increased productivity of labor.

This increased productivity has had its greatest growth during the last five or six years. It has been brought about by four outstanding developments. First, there is the item of capital expenditure through which mechanical devices, electrification, larger units, changed methods and processes have come about. Second, there is the item of improved management. Third, there is the item of increased efficiency on the part of labor itself. Fourth, there is the item of a steady reduction in accidents and other wastes with the resultant gain in working time and increased earnings and purchasing power of the worker.

By and large, we are getting a better quality of labor today. Workers are more intelligent—the school requirements of the country are helping in this regard. There is a better feeling in labor circles. High wages are generally paid and management is exerting every effort to maintain these levels. Shorter hours are worked. The men are working less arduously than formerly and all of these factors have tended toward increased individual output coupled with better safety performance. Then again the extended experience formerly required perform certain operations has been thrown to the winds until today we find that most jobs in our plants can be filled by new men under relatively brief training periods. So industry generally today is in the position of being able to obtain without difficulty sufficient labor of the type that lends itself more easily to rapid training in safe and efficient practices.

*Presented before the National Safety Congress.

Naturally we ask what has become of the workers released as a result of increased efficiency and newer methods in the older industries. Have they left the community or are they idling away waiting for an opportunity to be employed? Not at all, they have largely become absorbed in industries which greater buying power of labor generally has helped to create.

The experience of one particular community which is probably typical of many others reveals that many of these released workers are now employed in an automotive manufacturing plant; in the many garages that have come into existence; in the scores of filling stations and automotive supply houses; in manufacturing radio equipment; manufacturing modern household utensils; in public improvements, including highways and bridges and a host of other lines created and maintained by the buying power of the workers.

The community I have just mentioned is essentially a one industry center in that the large majority of its population is directly dependent for a livelihood upon one large company. It might be expected that the reduction of 3,000 workers in this plant during the last seven years would to some extent reduce or retard the growth of the local population or that there would exist severe unemployment. The facts are, however, the population has increased by 28 per cent and there is no perceptible unemployment.

Fortunate it is, therefore, as a corrective of that greatest of all evils—unemployment—that the purchasing power of the people generally is opening up new lines to afford employment to those being separated from their former industry. Then again many of the separations are among those older in years whose needs are less than those of the younger men with families, and the pension plan which is quite general in industry is helping to take care of these men who have been permanently released. As indicating the economic importance of these plans, Mr. A. H. Young estimates that annual industrial pensions alone paid throughout the United States amount to over $50,000,000.

Another factor that has helped to smooth adjustments between the old and new industries is the generally high saving power of the wage earner during this time of employment. This has been encouraged by savings plans, stock distribution and other facilities for thrift and investment which have aided employes in tiding them over from one industry to another. And industry itself is equipped today to be of service in this field by turning the efforts of its employment department from recruiting to placement on the outside.

The growing use of the automobile by the worker has had a tremendous beneficial effect upon the general labor situation. It has largely solved the fundamental problem of transportation for the worker and has greatly widened his working area. He no longer is at the absolute mercy of the neighboring employer for work, but the whole territory for miles around is now his to explore. And the employer too, has benefited, it has solved for him many of the major social conditions which a hoarded labor force around the plants always presented.

I have cited better management as one of the factors responsible for better labor relations. This generally includes a closer and more scientific administration of the payroll.

The efficiency of the employment department is now measured less by the speed with which it can recruit labor than by the aid that it can give management in avoiding the hiring of unnecessary people by transfer and other measures of labor conservation.

This increased care by management in administering the payroll is due largely to a desire to fortify the buying power of labor by holding to present wage levels in spite of decreasing commodity prices and the need for reducing manufacturing costs.

One of the aims of management in this respect is to obtain stability of employment and full-time wages for those employed. The organization of industry on such a basis that provides steady employment at full-time wages has become recognized as a sound policy from the standpoint of both the worker himself and of the company which employs him, and right here is where safety plays perhaps its most important role in the field of labor relations.

The necessity today for the high purchasing power of labor previously referred to becomes more significant in view of the fact that industry is organized on a mass production basis and this naturally requires mass buying. Perhaps this is one of the most important trends in the economics of this labor situation and in every labor policy today this element is basic. The ability to buy by the greatest number is of uppermost concern to the entire business world. Our industries have ceased to function solely or mainly to supply the needs of the wealthy classes. These needs would not be sufficient to maintain even a fraction of our present productive capacity. It is, therefore, imperative that we have a high and sustained buying power by the masses of the people including the wage earners. Industry generally is alive to the value of high purchasing power for its workers and has adopted the policy of paying high wages. These high wages coupled with the decline in living costs over the last few years have been a most powerful factor in extending markets and increasing the standard of living of workers. It is, therefore, evident that accidents as they affect this buying power are of greater concern today than

ever before and that their elimination is not only desired but urgently required.

Often overlooked is a further contribution by industry toward the purchasing power of labor through certain personnel activities that it has quite generally adopted. Among these activities is the practice of making up to employes a substantial part of losses in wages, that would otherwise be sustained through sickness and accidents, by the payment of relief and insurance benefits and workmen's compensation. This policy usually has been thought of from the standpoint of its advantages to the workers alone. Its importance as a means of helping to sustain purchasing power and thereby benefit general business has not been fully appreciated.

The most important contribution to the present state of affairs is that which is due to the cooperative relationship now generally existing between employers and employes. To reach the present basis industry has passed through several more or less clearly defined cycles: The first, of comparative indifference to the worker's relationship to the company which employed him other than as a cog in the machine; the second, realization on the part of its economic power and consequent conflict with capital by reason of the fact that their mutual interests in industry were neither seen nor understood; the third, an enlivened interest on the part of management in the human side of business and on the part of the workers in the prosperity of the business in which they are engaged.

The third, or cooperative phase, is manifested on every side today. Indeed the company which is not striving for good relations today is the exception.

Safety is wholly non-controversial; it is beneficial to employe and employer alike and has no negative values. It is perhaps the happiest medium through which may be expressed the mutuality of interest of employes and employers. Organized safety work began more than twenty years ago, and in my own industry largely under the inspiring example of the United States Steel Corporation it stands as a beacon light of progress. One of its prime factors has been the work of the safety committees, composed of workmen or of workmen and foremen and this was really the first widespread demonstration of mutuality of concern and purpose on the part of employers and employes in American industry. This evolution into the present era of cooperation is not a haphazard result. It is definitely the joint product of the management group in American enterprise acting with intelligent labor leadership and is perhaps the most conspicuous and constructive accomplishment of employe-management relations.

How closely safety is linked with this development is seen in the similarity between the technique of safety work and the technique of good management. Foremost industrial leaders today view safety as much a part of the day's work as any other manufacturing problem.

Industry cannot operate efficiently and leave out safety, nor can business properly consider safety without relating it to the whole picture of the responsibility of plant operation in the most economical and efficient manner. We have in the past continually stressed the importance of reducing accidents mainly from a welfare or humanitarian standpoint. I do not fear that we will ever take a backward step in this regard, but let us in the future give our safety or accident prevention work a new stimulus, let us consider it as an important factor in our whole program of greater manufacturing economy.

The accident prevention movement can have a tremendously beneficial influence on general business, every accident that is avoided not only benefits the workman from a physical and monetary standpoint but it results in a direct contribution to general business. I know of an accident prevention campaign recently inaugurated that in the course of only nine months resulted in a saving to employes in wages alone of nearly a million dollars and the savings to the company are also substantial. Without detracting in any way from the broad humanitarian aspects of this work does not a consideration of the economic aspects of what this million dollars means in sustained purchasing power, in providing steady employment and keeping the wheels of industry moving furnish a new measure of appraisal of the important place which safety holds in the sphere of labor relations.

Good safety is necessarily a component of good labor relations and good labor relations spell safety in a much larger sense than as applied to mere accident prevention.

He would indeed be a brave man who would attempt to place an absolute economic value on the development in good labor relations in American Industry over the last decade or two, but it is a certainty that the wise attitude of cooperation and conciliation generally existing between management and labor in this country has been one of the most powerful factors in helping American Industry to achieve the leadership which it enjoys today. If we would know what might have been all we have to do is to examine the records where such cooperation has not existed to see the full effect of conflict, misery, economic suffering and business stagnation.

Good labor relations mean the safety and security of our social, economic and political well-being. It follows, therefore, that those who are bending their efforts to rid industry of the waste occasioned by accidents are engaged in a work that is essential to economic progress.

TARVIA LITHIC PLANT NEAR TRAP ROCK OPERATION

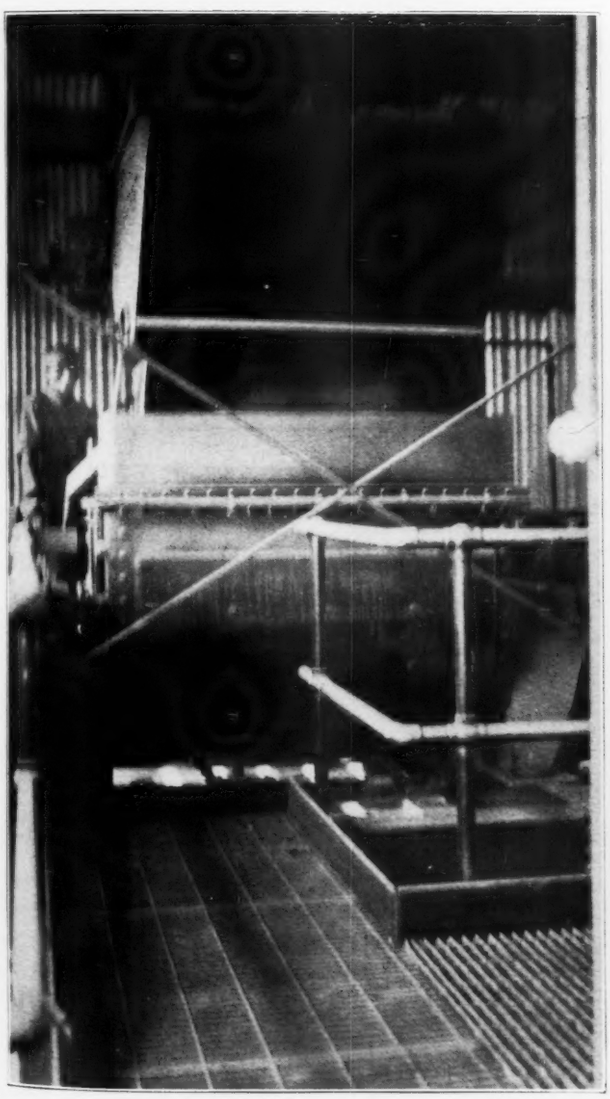
By F. A. Westbrook

THE Barrett Company of Philadelphia has recently erected a Tarvia Lithic plant adjacent to the Rocky Hill crushed trap rock plant of the Connecticut Quarries Company in order to have easy access to a supply of the proper kind of stone. A Weller belt conveyor is used between the two plants. As shown in one of the illustrations, the conveyor runs horizontally along the bottom of the bins of the Connecticut Quarries Company and then on an incline up to the dryer of the Barret Company. This conveyor is driven by a Westinghouse motor through Cleveland reduction gears.

Stone from the conveyor is discharged into the upper end of the McDermott cylindrical dryer. Hot air from the oil burners is driven from the lower end of the dryer against the flow of stone at the rate of 3,200 cubic feet per minute by a Buffalo Duplex Conoidal fan. This hot air dries stone and cleans it, blowing the dust up the stack.

Oil Burners at Lower End of Dryer.

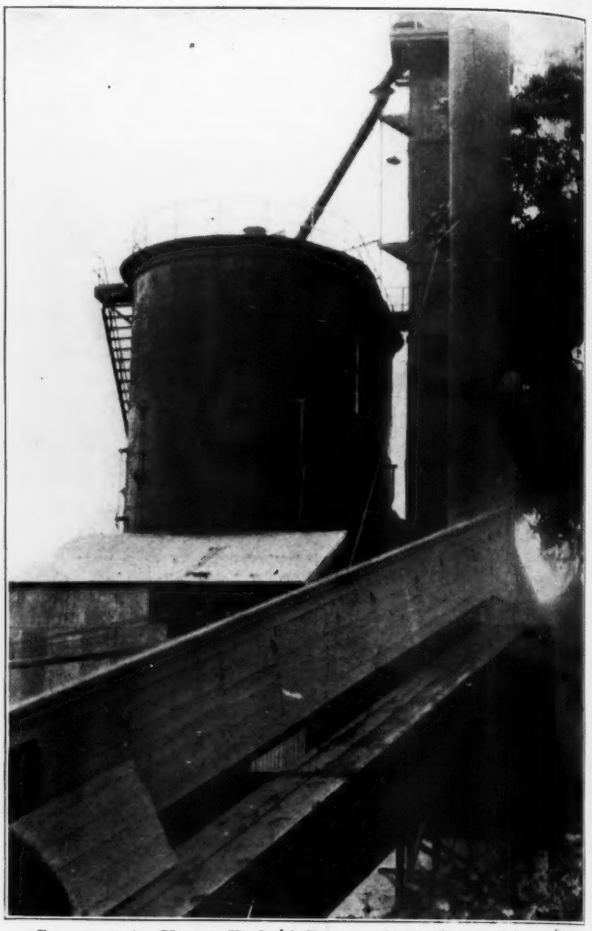
The cleaned, dried and warmed stone then drops from the lower end of the dryer into a Link Belt elevator, from the top of which it flows into two steel storage bins built and erected by the Berlin Construction Company, from the Barrett Company drawings. Under each of these bins is a Cummer



One of the Mixers

View of Dryer, Elevator and Stone Bins.

Belt Conveyor.



Conveyor to Upper End of Dryer. Steel Stone Bins in Background.

Elevator to Stone Bins With Mixer House in Foreground.

tarvia mixer which discharges directly into freight cars standing on the tracks below. There are also two tarvia tanks, an oil tank and a water tank.

There is a very neat office building which, together with the shed over the oil burners and the housings for the mixers, is sheathed with galvanized corrugated steel. The capacity of the plant is 400 tons per day. Shipments can be made by truck as well as by rail and, although the plant is so recently finished that some of the last touches are still in progress, it is already flooded with orders. The electrical equipment is Westinghouse throughout.

Road from Acapulco to Pie de la Cuesta, Mexico

The road from Acapulco to Pie de la Cuesta, that has been under construction by the Acapulco Chamber of Commerce has now reached 8 kilometers or about two thirds of its length, has been built. A force of about one hundred native workmen have been continually employed on this project and it is expected that it will be passable its entire length by the end of next December or January. (Vice Consul Harry Pangburn, Acapulco.)

November Construction Record

New construction started in the 37 states east of the Rocky Mountains during the first eleven months of this year, amounting to $6,195,529,800, shows an increase of 6 per cent over the amount started during the corresponding period of last year, according to F. W. Dodge Corporation. The territory covered in the 37 states represents about 91 per cent of the country's total construction. Of the eight districts reviewed below, three of them have shown increases over their totals for the entire year 1927. These districts are: The New England States, the Middle Atlantic States and the Central West.

During the past month there was $471,482,200 worth of contracts let on new building and engineering work in this area. The above figure shows a gain of 1 per cent over the total for November of last year, but there was a loss of 21 per cent from the October, 1928, total. Last month's contract total included the following important classes of work: $200,225,700, or 42 per cent of all construction, for residential building; $93,227,600, or 20 per cent, for public works and utilities; $68,309,100, or 14 per cent, for commercial buildings; and $38,664,900, or 8 per cent, for industrial projects.

New contemplated projects as reported last month reached a total of $931,113,800. This figure represents increases of 51 per cent over the amount reported in the preceding month and of 13 per cent over the amount reported in November of last year.

New York State and Northern New Jersey

Building and engineering contracts were awarded last month in New York State and Northern New Jersey to the amount of $135,040,700. This figure was the second highest November contract total on record for this territory. It was 4 per cent ahead of the total for the same month of last year, but there was a drop of 28 per cent from the total for October of this year.

Included in the November building record were the following important classes of work: $71,222,600, or 53 per cent of the total, for residential buildings; $21,679,800, or 16 per cent, for commercial buildings; $13,093,700, or 10 per cent, for public works and utilities; $9,502,500, or 7 per cent, for hospitals and institutions; and $9,360,200, or 7 per cent, for educational projects.

New construction started in this district during the past eleven months has reached a total of $1,675,976,100, being an increase of 8 per cent over the amount started during the first eleven months of last year.

Contemplated projects as reported last month in New York State and Northern New Jersey amounted to $199,350,000. There was a 32 per cent gain over the amount reported in October of this year and there was an increase of 42 per cent over the amount reported in November, 1927.

Construction in New England States Exceeds 1927 Total

The New England States had $30,638,100 in contracts for new construction work during the past month. The above figure was 26 per cent below the total for the preceding month of this year and there was a drop of 29 per cent from the total for November of last year. Analysis of last month's contract total showed the following important items: $15,803,000, or 52 per cent of all construction, for residential buildings; $8,329,900, or 27 per cent, for commercial buildings; $2,718,000, or 9 per cent, for public works and utilities; and $1,384,900, or 5 per cent, for industrial projects.

New construction started in the New England States during the first eleven months of this year, amounting to $467,358,100, shows a gain of 13 per cent over the amount started during the entire year 1927.

New projects reported as contemplated last month reached a total of $34,088,800. This figure was 12 per cent under the total for October, 1928, and there was a drop of 40 per cent from the total for November, 1927.

Construction in Middle Atlantic States Ahead of Total for Last Year

November contracts let on new construction work in the Middle Atlantic States (Eastern Pennsylvania, Southern New Jersey, Maryland, Delaware, District of Columbia and Virginia) amounted to $54,581,500. This figure was the second highest November construction total ever recorded in this district. It was 14 per cent ahead of the total for November of last year, but there was a 30 per cent decrease from the total for October of this year.

The following were the most important classes of work included in last month's building record: $20,314,100, or 37 per cent of all construction, for residential buildings; $13,647,900, or 25 per cent, for public works and utilities; $5,006,400, or 9 per cent, for industrial plants; and $4,970,200, or 9 per cent, for commercial buildings.

During the past eleven months there was $735,710,700 worth of new building and engineering work contracted for in the Middle Atlantic States. This figure shows an increase of 9 per cent over the amount contracted for during the corresponding period of last year and there was an increase of 2 per cent over the amount contracted for during the entire year 1927.

New contemplated work as reported last month amounted to $172,417,800. This figure is more than double the amount reported in October of this

year and there was a 21 per cent increase over the amount reported in November of last year.

The Pittsburgh District

The November volume of construction contracts let in the Pittsburgh district (Western Pennsylvania, West Virginia, Ohio and Kentucky), amounting to $60,367,800, was the second highest November contract total yet recorded in this territory. It was 42 per cent in excess of the total for the same month of last year, and it was almost the same as the October, 1928, total.

Analysis of last month's construction record showed the following items of note: $21,401,000, or 35 per cent of the total, for public works and utilities; $14,333,500, or 24 per cent, for residential buildings; $15,446,700, or 26 per cent, for industrial projects; and $4,750,400, or 8 per cent, for commercial buildings.

Last month's contract total brought the amount of new construction work started in the Pittsburgh district since the first of this year up to $684,321,900, being a drop of 4 per cent from the amount started during the corresponding period of last year.

Contemplated work as reported last month in this district reached a total of $103,314,500. There was an increase of 37 per cent over the amount reported in October of this year, but there was a loss of 25 per cent from the amount reported in November of last year.

The Central West

The Central West (Illinois, Indiana, Iowa, Wisconsin, Southern Michigan, Missouri, Kansas, Oklahoma and Nebraska) had $136,100,800 in contracts for new building and engineering work during the past month. The above figure was the second highest November contract total on record for this district. It was 12 per cent in excess of the total for the same month of last year, but there was a loss of 12 per cent from the total for October of this year.

The most important classes of work in last month's building record were: $59,390,400, or 44 per cent of all construction, for residential buildings; $28,447,200, or 21 per cent, for public works and utilities; $19,958,600, or 15 per cent, for commercial buildings; and $10,472,500, or 8 per cent, for educational projects.

New construction started in the Central West during the first eleven months of this year has reached a total of $1,814,315,400, being an increase of 10 per cent over the amount started during the corresponding period of last year and a gain of almost $1,500,000 over the amount started during the entire year 1927.

Contemplated projects as reported last month in this district amounted to $349,695,900. New roadway construction contemplated in the state of Iowa and costing $100,000,000 helped to make last month's total almost double that of October of this year and 63 per cent ahead of the total for November of last year.

The Northwest

Minnesota, the Dakotas and Northern Michigan had $5,764,000 in contracts for new construction during the past month. The above figure was 16 per cent ahead of the total for November of last year, but there was a loss of 40 per cent from the total for October of this year. The following were the most important items in last month's record: $2,119,300, or 37 per cent of all construction, for residential buildings; $2,080,000, or 36 per cent, for commercial buildings; $743,900, or 13 per cent, for public works and utilities; and $275,300, or 5 per cent, for educational projects.

During the past eleven months there was $76,362,700 worth of contracts let on new building and engineering work in the Northwest, as compared with $80,784,100 for contracts let during the corresponding eleven months of last year, the decrease being 5 per cent.

New contemplated work as reported last month in this district reached a total of $10,923,600. There were increases of 11 per cent over the amount reported in the preceding month and of 4 per cent over the amount reported in November, 1927.

Southeastern States

The November volume of construction started in the Southeastern States (the Carolinas, Georgia, Florida, Tenessee, Alabama, Mississippi, Arkansas and Louisiana) amounted to $29,740,700. This figure represents losses of 42 per cent from October, 1928, and of 44 per cent from November, 1927. Included in the November contract total were: $10,844,800, or 36 per cent of all construction, for residential buildings; $7,451,500, or 25 per cent, for public works and utilities; $3,700,500, or 13 per cent, for commercial buildings; and $2,667,700, or 9 per cent, for educational projects.

New building and engineering work contracted for in these states during the first eleven months of this year amounted to $527,029,500, which was a loss of 6 per cent from the amount contracted for during the first eleven months of last year.

Contemplated new work as reported last month in the Southeast reached a total of $42,142,100. There was a decrease of 17 per cent from the October, 1928, total, and there was a loss of 32 per cent from the total for November of last year.

Texas

New construction started in Texas during the month of November amounted to $19,248,600. This figure was 34 per cent ahead of the amount started

(*Continued on page 58*)

BUREAU OF MINES IN THE MINERAL FIELD

THE study of measures for the safeguarding of the lives and health of the more than 2,000,000 workers in the nation's mining, metallurgical, and oil and gas industries formed the major activity of the United States Bureau of Mines in the fiscal year 1928, states Scott Turner, director of the Bureau, in his annual report made to the Secretary of Commerce. The attainment of increased efficiency in the mining, treatment and utilization of the country's greatly varied mineral materials, whose products are valued at more than six billion dollars annually, also occupied much of its attention.

Nearly 50,000 workers in the mineral industries were trained in first aid or mine rescue methods by the personnel of the mine rescue cars and trucks, establishing a new record in such activities, and bringing the total number so trained by the Bureau since its creation to approximately 250,000. This training was given in 537 mining, metallurgical, quarrying, and oil producing communities in 36 states and Alaska.

The practice of thoroughly rock dusting bituminous coal mines as a means of preventing and limiting mine explosions was urged vigorously, Director Turner points out. Tests to determine the explosibility of various coal dusts and the efficacy of varying percentages of different stone dusts in checking the explosion of these coal dusts were conducted in the Bureau's experimental coal mine near Pittsburgh, Pennsylvania, the only mine in the world owned by a governmental bureau and operated for the sole purpose of conducting scientific investigations. During the year the one-thousandth coal dust explosion test made in the experimental mine was conducted in the presence of a large assemblage of mining men.

The exchange of workers in mine safety research and the interchange of information between the United States Bureau of Mines and the British Safety in Mines Research Board continued to advance materially the fundamental research connected with the prevention of explosions in coal mines. Health and sanitation problems of the mineral industries were given attention, especially with reference to poisonous gases, unwholesome dusts, and unhealthful conditions of temperature and humidity to which the miner is often exposed. In the operation of the clinic, conducted at Picher, Oklahoma, about 10,000 workers in the zinc and lead mining industry were given physical examinations.

The investigations of the mining division included drilling and blasting, loading of ore and coal, mine timbering, the breaking and handling of ore, mine ventilation, underground transportation, mine sampling methods, and efficiency of mine labor. Special attention was given to geophysical prospecting, that interesting recent development which is making possible the location of hidden mineral deposits. An ever increasing amount of mineral wealth is being recovered by stripping operations, and the bureau is studying the efficient use of excavating machinery in open cuts. The subsidence of land after mining operations was given attention, notably in the Michigan metal mining region. A study of mining methods and costs in coal and metal mines of the principal mining districts of the United States was begun.

In the field of metallurgy the Bureau continued to contribute to the practical conservation of the mineral resources through the development and improvement of methods for recovering more of the mineral content of ores, with attendant lessening of the cost of recovery. The Bureau was able to render further service in the improvements of methods for the treatment of complex or low grade ores of the Western States, a matter vitally affecting the prosperity of those States. The experimental iron blast furnace, the only one of its kind in the world, was used in obtaining valuable fundamental data on the smelting of iron ores. This experimental furnace is being used in the effort to find a way to recover profitably the manganese content of the low grade manganiferous iron ores of northern Minnesota, and thus to render available supplies of this material essential in the manufacture of steel and therefore a commercial and military necessity. It continued its efforts to assist in the development of commercial supplies of the different essential mineral materials of which the nation does not possess adequate reserves.

Increased attention is being given to research looking to the more efficient mining, treatment, and utilization of the numerous important nonmetallic minerals, which enter so largely into the construction of buildings and highways. Studies were conducted in the physical chemistry of steel making, with a view to obtaining fundamental data essential in the development of new processes, improvement of quality, elimination of waste, and more economical production. Special attention was given to various metallurgical problems of vital interest to the development of the copper mining industry, and to the improvement of milling practice in the Missouri, Kansas, Oklahoma lead and zinc district.

In the effort to stimulate the development of domestic potash, and thus relieve the American farmer of foreign control of that essential fertilizer material, the bureau continued the drilling of test wells in Texas and New Mexico. A number

of beds of potash-bearing salts, of varying thickness and value, have been found. Attention was given to the beneficiation of the low grade bauxites of Alabama, Georgia, Tennessee and Mississippi, and the low grade phosphate ores of Florida. Increasing interest in mica, particularly for radio and electrical equipment, led to a survey of the industry. A study was made of the practicability of substitution of the native yellow, brown and lead ochres and other mineral pigments of Oregon and Washington for such materials imported from various foreign countries.

It being estimated that 75 to 85 per cent of the oil underground is not recovered by practices now in common use, the Bureau continued its studies designed to assist in increasing materially the percentage of oil recovered from underground deposits. The petroleum and natural gas division conducted investigations in drilling and production, storage, transportation, and utilization of crude oil and natural gas, and in the recovery and use of gasoline and other products, with the object of determining losses and of devising means for their prevention. Funds having been provided for the continued operation of the experimental oil shale plant near Rulison, Colorado, the plant was reopened during the year, and studies have been resumed which it is hoped may be of value in the future development of a great American oil shale industry. The work on safety in the oil fields and refineries of the United States was actively continued.

A contract was awarded for the erection of a helium production plant at Soncy, near Amarillo, Texas, where a new supply of helium bearing natural gas has been found to replace the fast diminishing supply in the Petrolia, Texas, gas field. As the percentage of helium content in the Amarillo field is much higher, it is expected that the cost of helium in the new plant will reach figures lower than any heretofore attained. Supplies of helium sufficient to take care of the requirements of the dirigibles of the Army and Navy for several years to come are believed assured.

The Bureau continued its work in the study of efficiency in the use of fuels. This work included the making of numerous analyses of coals, the study of combustion problems, the utilization of low grade fuels, the prevention of smoke, and the study of new developments in fuel technology, such as the combustion of powdered coal and the low-temperature carbonization of coal. It is now investigating the extraction of motor fuels from coal, a source of supply which many believe will help appreciably in insuring continued operation of the nation's millions of automobiles. As the result of a fuel-economy survey, large sums are being saved annually in the operation of Government heating and power plants. A study is being made of the factors relating to the possible substitution of manufacture for natural gas as the supply of the latter is exhausted.

During the year increased interest was displayed by manufacturers of gas masks in having their products approved by the bureau. The city of New York passed an ordinance requiring that all refrigerating plants or installations above a certain minimum size have available respiratory protective devices approved by the Bureau of Mines.

In addition to studying the scientific and technical problems of the mineral industries, the Bureau is giving increased attention to economic conditions and problems. This involves the collection and dissemination of statistical data regarding the production, consumption, distribution, and storage of the numerous essential minerals.

As a feature of its work in endeavoring to promote safety and efficiency in the mineral industries, the Bureau of Mines has prepared what is probably the largest collection of educational industrial motion picture films in the world. These films are intended to explain the different steps in the production, treatment, and utilization of the essential mineral materials, and to illustrate safe methods of mining and preparing minerals. The films are produced through the co-operation of industrial concerns which bear the entire cost of production. On June 30, 1928, the bureau had 560 sets of films, aggregating 1,483,000 feet. During the year the films were shown on 9,369 occasions before an estimated attendance of 1,645,000 persons.

(*Continued from Page* 56)

in October of this year, but there was a drop of 16 per cent from the amount started in November of last year. Analysis of last month's building record showed the following items of interest: $6,198,000, or 32 per cent of all construction, for residential buildings; $4,724,400, or 25 per cent, for public works and utilities; $3,230,600, or 17 per cent, for industrial projects; and $2,839,700, or 15 per cent, for commercial buildings.

During the past eleven months there was $214,455,400 worth of contracts let on new construction work in Texas, being a gain of 4 per cent over the amount contracted for during the corresponding eleven months of 1927.

New work contemplated in this state in November reached a total of $19,181,100. There was a loss of 9 per cent from the amount reported in October of this year and there was a drop of 69 per cent from the amount reported in November of last year.

WASTE HEAT EQUIPMENT FOR PORTLAND CEMENT MILLS

By L. Eck, Dipl. Eng., Works Manager*

OVER a period of three years the "Portland-Cementwerken 'S a a l e' Aktien-Gesellschaft," a large producer of cement at Halle, Germany, considered the installation of waste heat equipment back of the rotary kilns. The problem was complicated by the fact that the space for such equipment was limited, not being sufficient for the use of waste heat boilers. When the Marguerre process was developed, the essential characteristics of which include great flexibility of the heating body system and the small amount of space required, the proposal was taken up again, and the matter discussed with the concern holding the construction rights for the Marguerre process, the Kraftanlagen-Aktiengesellschaft in Dessau.

The process is based upon the use of water as a circulating medium. It is compressed by a pump, heated in a heating body system and partially evaporated by expansion below its saturation temperature. The non-evaporated water flows back to the pump and again enters the circuit. The amount of transformed water is regulated automatically.

Figure 1 shows the plan of such an arrangement. It consists of the heating body system 1a to c, the evaporator 2, the pump 3 and the regulation equipment 4a, b. The manner of working is made clear from the following example: 6 to /h steam of 12 atu/350 are to be produced from feed water of 40 deg. The evaporator, like the upper part of a boiler for the same pressure is filled with water of about 191 deg. This water flows to the transformer pump 3 with 12atu and is brought under pressure to about 18.5 atu. The transformed water amounts in quantity to about 200 m3/h.

The heating body system consists of the feed water pre-heater 1a, the transformation economizer 1b and the superheater 1c. The water from the transformer pump 3 enters the transformer economizer at about 18.5 atu/191 deg. is raised in it about 15 deg. and leaves with about 206 deg. and 18 atu.

On entering the evaporator the water expands in a sprayer 4a. As soon as the pressure here has been reduced to the saturation pressure corresponding to the temperature of 206 deg. of about 17 atu, the water commences to evaporate partially. On leaving the spray the pressure will have dropped to about 12 atu. In this case about 3 per cent of the water moved has been evaporated, that is to say, 6 to /h. This steam is separated in evaporator 2 and sent to the superheater 1c. The feedwater corresponding to the steam produced is fed to the evaporator through a feeding device of customary construction after preheating in the heating body system 1a.

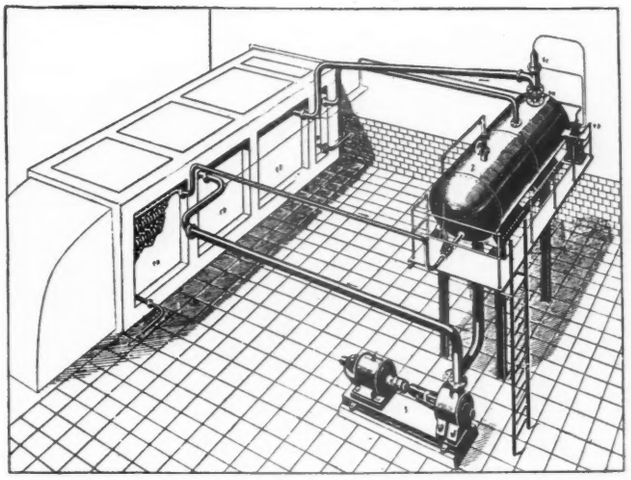


Figure 1—Plan of a Waste Heat Equipment on the Marguerre Plan.

The amount moved by the pump is regulated by adjustment of the chamber 4a by means of the regulator 4b and the steering cylinder 4c in such a manner that the variation in temperature is kept constant between 191 deg. and 206 deg. If steam production increases more water is moved and vice versa.

The installation, accordingly, works similarly to an ordinary boiler, the transformation economizer corresponds to the heating tubes, the evaporator to the upper section of the boiler. By means of the pump a two-phase circulation is attained. The evaporator and the heating body system, accordingly, can be separated the one from the other at will. By means of the pump there is produced simultaneously so high a pressure that evaporation will not take place in the transformer economizer. For this reason ordinary economizers can be employed as heating bodies. By means of a regulation of the water circulation there is a constant moving of the exact amount of water required with the certainty of non-steam production in the economizers.

In case of the employment of rib tube economizers it is possible to cut down the space required for the heating body system to the lowest minimum. The construction or building up out of entirely identical units is the reason for the great adaptability. Evaporators and pumps can be placed in any desired location.

*The Marguerre process installed at the "Saale" mill at Halle, Germany.

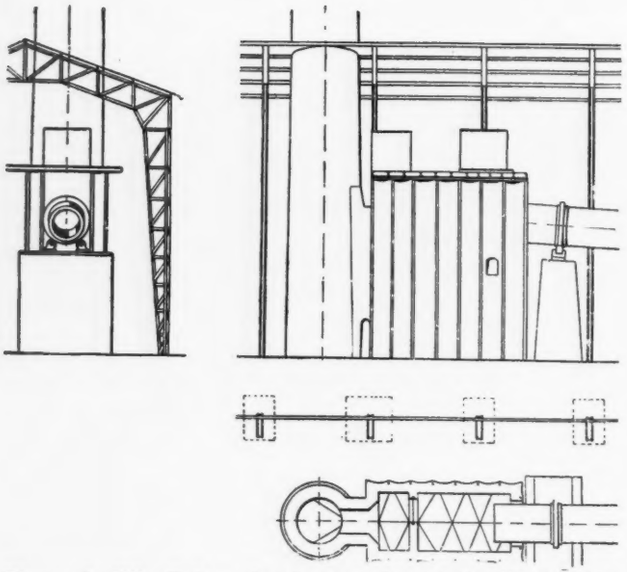


Figure 2—Kiln Before the Construction of the Waste Heat Equipment.

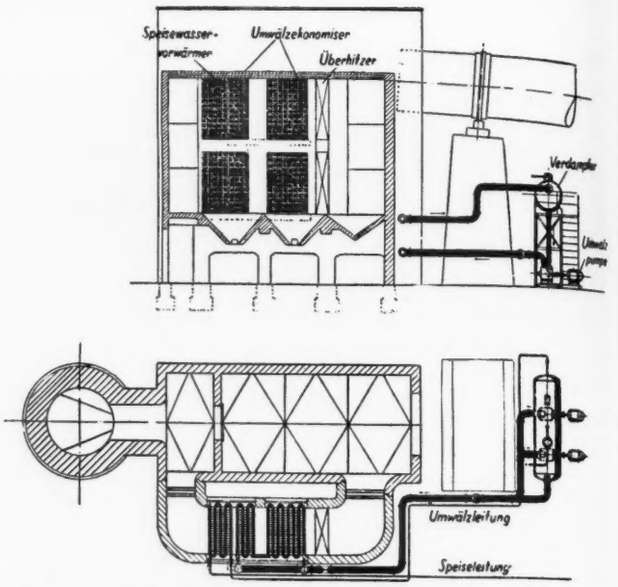


Figure 3—First Proposal With Lateral Arrangement of the Heating Bodies

Figure 2 shows the arrangement in the oven house at "Saale" before the installation of the waste heat plant. The arrangement of the kilns and dust chambers is in keeping with the prevailing plan of construction. There are two kilns. Kiln, dust chambers and chimney are all in a line. Back of the chimney is the preparation department. The kiln distance is about 6.5 m. The distance of the wall of the dust chamber from the wall of the building is about 3.5 m.

At the Leimen Cement Works it had been found that it was possible to keep the heating surfaces clean by means of the blow-off equipment in the case of a rib tube economizer placed back of a waste heat boiler, it was decided to have a heating body system of cast iron rib tubes for the transformer economizer and pre-heater, taking into consideration the small amount of space available toward the interior. The superheater consists of pipe coils of the customary type of construction.

The tubes of the transformer economizer and of the feed water pre-heater are mutually interchangeable and in case of need a part of the pre-heater can be coupled up with the transformer economizer by a placing of the collecting tubes and vice versa. In carrying out the installation it was kept in view to provide for a future placing of pipe lines, for example: In case of an extension of the sintering zone in the kilns in change of operation with increased output in view, to obtain an extension of the heating body system, this being an advantage which is a desirable feature of this type of installation.

In the first plan provision was made as in Figure 3 for the placing of the heating bodies by the side of the dust chamber. Evaporator and pumps were to be ahead of and by the side of the upper part of the kiln drum respectively. As an alternative provision was made for the installation of a heat feeder in order to equalize the variations in the kiln operation. This also could be readily combined with the system as shown. The placing of the heating bodies by the side of the dust chamber had the advantage that the latter could remain intact. All that was required was to close the opening in the partition wall by means of a slide. To effect connection with the waste heat installation all that was necessary was an opening to take the gases from the fore part and as had been planned, a second one for their return in the back portion. These changes it was possible to effect during a short pause in operations during the season. Thus it was not necessary to defer them to the winter.

The installation of the equipment was decided on in March, 1927. At the same time contracts for the enlarging of the sintering zone were given to the firm of G. Polysius. As in this case, however, it was imperative to stop the kilns, it was no longer necessary to reckon with operation during the placing of the heating bodies.

Accordingly it was decided to place the heating bodies in the rear part of the dust chamber as in Figure 4. This made it possible to place evaporator and pumps side by side by the fore part of the dust chamber. With this construction the gases are brought to the heating bodies through an inverted vertical U. They first pass the super-heater and a portion of the transformer economizer and the pre-heater from top to bottom and are drawn by the exhaust and forced into the connection between the dust chamber and the chimney.

A channel between the heating bodies leads directly to the chimney, this simple provision providing by a by-pass for the gases at any time it be desired to throw the waste heat installation out of the circuit of operation and to work directly. When operating with the waste heat equipment

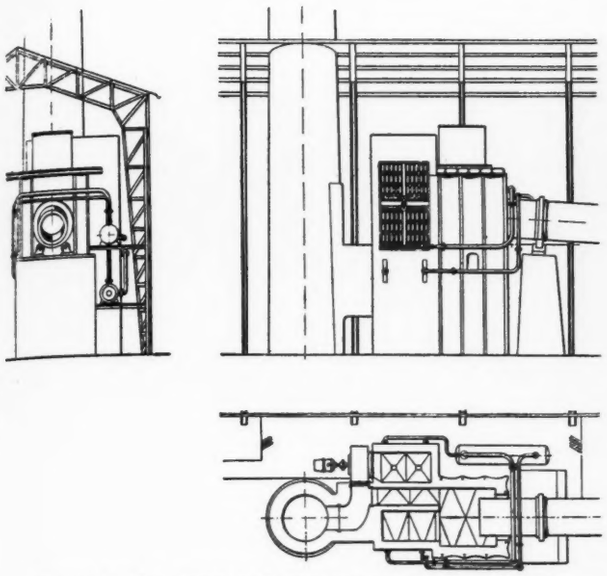


Figure 4—The Completed Equipment. Heating Bodies Arranged in Back Portion of Dust Chamber.

this channel is closed by means of a slide.

A comparison of the two dust chambers clearly demonstrates the small amount of space required and makes evident the adaptability of the installation to spacial requirements. It was practically possible in entirety to place in profile with the dust chamber the heating body system of about 2100 m^2 of rib heating surface for the transformer economizer and about 700 m^2 for the pre-heater as well as about 180 m^2 of heating coils for the superheater.

Pumps and evaporator were placed one above the other, both elevated. This made it possible to have a clear passage on floor level, an imperative requirement in spite of the restricted space. Pumps and blowers on the one hand and evaporator and regulation devices have central control from kiln control board. All indicating devices are placed on a level with the pump control devices. The working can easily be kept in view in so far as the same is necessary. The putting in place of the heating body system is simple and was carried out quickly.

The passage on floor level is clear. Pump regulation is carried through and continued in the section over the slime sump. The exhaust fan as is shown in Figure 5 is placed on the back of the waste heat installation and on a level with the control fixture. The blow-off arrangements for the economizer can be seen in the same illustration. It is set in action by chains from the pump control fixture. To the left of the building stands the single feed pump. To the rear of this the indicating devices are placed. Provision for the separation of this room from the kiln room at a later date has been made.

Figure 6 shows the heating body system; on the upper portion of the transformation economizer, the

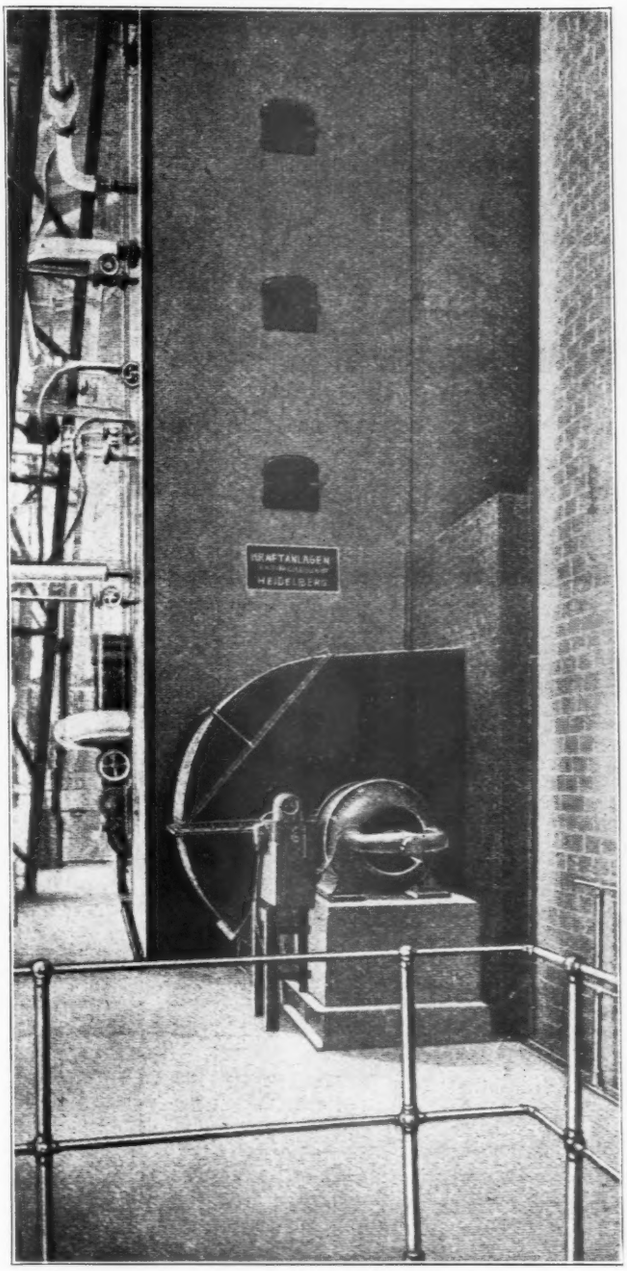


Figure 5—View of the Covered Heating Body System from Chimney Side.

removable side plates have been taken off. The horizontal tubes are connected by means of return bends. As can be seen from Figure 7 the ribs of the heating tubes stand vertically. Any eventual deposition of dust can accordingly be readily removed by means of the blow hose. The two rails also serve as a guide for the blower which runs on rolls. The blower system consists of two vertical tubes which are carried through the open space under the rails. From these tubes, there branch out between every rib tube series of horizontal tubes provided with perforations which reach the entire width of the heating body system and can be shoved in direction with the axis of the rib tubes. By means of this arrangement, it becomes possible to blow clean every individual rib from one end of

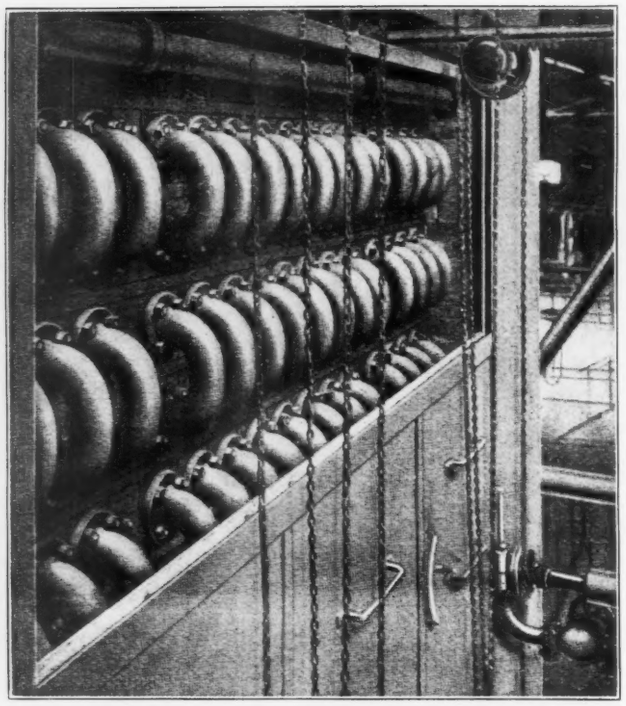


Figure 6—Side View of Heating Body System. Side Covering Removed in Part.

a tube to the other by a single movement of the blower. During the time the soot blower is not in action the arrangement can be shoved to either end. Passage of gas through the vertical channels under the rails is prevented by means of deflectors in order to prevent passage of a part of the smoke gases through the same instead of through the heating bodies.

Before the alteration the kiln had a capacity of 170 to/day. By the widening of the sintering zone this was to be increased to 200 to/day. The works are operated on the wet plan. In order to estimate for the waste heat installation the following conditions were taken as a basis:

Output 200 to/day.

Consumption of coal 33 per cent with a thermal value of 6200 kcal/kg.

Water content of slime 40 per cent.

In kiln head 15 per cent of excess air was reckoned with.

The total was about 4.21 m^3 smoke gases/kg of clinker with a CO_2 content of about 24.2 per cent.

It was assumed that between the kiln head and the waste heat equipment there would be an infusion of 10 per cent stray air, that is to say about 0.22 m^3/kg of clinker so that the quantity of smoke gases on entering the waste heat equipment would be 4.43 m^3/of clinker, that is to say with a kiln load of 200 to/day:

$$\frac{200{,}000}{24} \quad . \quad 4.43 = 37{,}000 \text{ } m^3/h.$$

At the kiln head there was reckoned on a smoke gas temperature of 540 deg. and on entering the waste heat equipment on one of about 515 deg. Taking into consideration the existing turbine the waste heat equipment was planned to 12 atu operating pressure and 350 deg. For these operating conditions the Kraftanlagen-Aktiengesellschaft guaranteed an output of 5800 kg/h of steam measured at leaving superheater with a feed water temperature of 80 deg.

The condensate commences to drop at about 45 deg. It was foreseen that heating of same to about 80 deg. was to be effected before entry into the feed water preheater in order to prevent a deposition of water through cooling below the dew point which lies at about 65 deg. to 70 deg. Later on this preheating was abstained from, a partial cooling of the smoke gases below the dew point being possible only with a poor circulation of gas. With the clear movement of smoke gases resultant with the employ of homogeneous heating bodies the formation of dead corners can not take place. Accordingly the feed water preheater is fed directly with the returning condensate.

At the shut down trial the output of the kiln was 203 to/day, the coal consumption was 34.8 per cent with a thermal value of 6200 kcal/kg. The smoke gas temperature averaged 495 deg. on entering the waste heat equipment. The output of the waste heat equipment was ascertained in the following manner. The boiler supply was cut off and the turbine fed exclusively from the waste heat equipment. The condensate from the turbine was measured by weighing. The output from the turbine at the same time served as a check.

The pressure of the steam produced amounted to an average of 12.5 atu., the temperature was 370 deg. and the feedwater temperature 45 deg. The result of the weighing showed a condensate fall of 5960 kg/h. The average output of the turbine amounted to 760 kW corresponding to a steam consumption of 7.85 kg/kWh. At a previous trial the steam consumption of the turbine was fixed at 8.4 kg/kWh. The decrease in steam consumption of the turbine amounting to about 6.5 per cent is explained by the more intense superheating. If the steam and condensate losses in the steam lines be placed at three per cent only, the amount of steam from waste heat equipment will amount to 6150 kg/h.

The heat content of the steam produced of 12 atu/370 deg., according to the table of Mollier is 763.5, that is to say the production heat with a feedwater temperature of 45 deg., 718.5 kcal/kg. From this the total quantity of heat given by the waste heat equipment figures up as follows:

$$718.5 \quad . \quad 6150 = 4{,}420{,}000 \text{ kcal/h.}$$

With a steam pressure of 12 atu and 350 deg. the heat content of the steam is 753.5 and the production heat 673.5 kcal/kg at a feed water temperature of 80 deg. The heat quantity to be furnished by the waste heat equipment according to

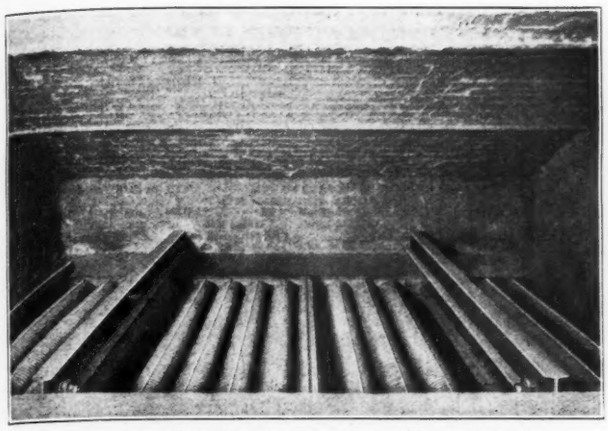


Figure 7—Rib Tubes and Upper Arrangement.

the guarantee in the contract, accordingly amounted to:

5800 . 673.5= 3,900,000 kcal/h.

The excess output accordingly amounted in round figures to 13 per cent. On the basis of contract conditions the output of the waste heat equipment corresponds to a steam production of 6550 kg/h.

The heat supply to the rotary kiln with a load of 200 to/day and a coal consumption of 33 per cent and 6200 kcal/kg corresponding to the guarantee conditions amounts to:

$$\frac{200{,}000}{24} \cdot 0.33 \cdot 6200 = 17{,}050{,}000 \text{ kcal/h.}$$

The heat supply in the shut down trial with a load of 203 to/day with an approximate coal consumption of 34.68 per cent and 6200 kcal/h thereagainst runs to:

$$\frac{203{,}000}{24} \cdot 0.348 \cdot 6200 = 18{,}250{,}000 \text{ kcal/h.}$$

The heat supply in the shut down trial accordingly was about seven per cent higher which is reckoned against the approximately 13 per cent higher heat delivery of the waste heat equipment.

By means of steam production from waste heat the load on the directly heated central boiler plant is lessened. Lignite is the fuel used in the boiler plant. The price of coal is 7.20 RM/to of steam. The evaporation figure amounts to 2.5 kilos of steam per kilo of coal, accordingly the steam cost is $\frac{7.2}{2.5}$ = 2.88 RM/to of steam. The saving per hour in the expense for coal accordingly amounts to about 15 RM.

According to the experience obtained at "Saale" where a very hard raw water is under consideration, self purified water has shown itself to be unsuitable on account of the salt forming too strong a concentration in the relatively small evaporator and which can readily be entrained with the extremely rapid steam production resulting in the contamination of the power machines. When this risk became known condensate was used exclusively, which was obtained in a surface condensor of a turbine equipment.

Especial attention must be given to the feed water and care be taken to provide for a sufficient purification. Difficulties which were met with at first in the equipment were remedied by the exclusive use of turbine condensate. With the customary purification method, it is to be guarded against the same as in high-output boilers, the prevention of an accumulation of salts remaining in the water in the drum and evaporator being effected by means of settling.

"How High Should Labor Turnover Be?"

If the idea of pooling experience works well in production, sales and other fields, why should it not work well in the personnel field also? counter-questions the fourth leaflet in the Labor Turnover series issued by the Policyholders Service Bureau of the Metropolitan Life Insurance Company.

This Bureau for several years has been pooling the turnover experiences of 300 manufacturers giving employment to 600,000 employees engaged in diverse industries and located in widely scattered parts of the country. A description of the workings of the system and the graphic results are charted in this leaflet.

The points made in this pamphlet may be briefly summarized:

1. In business fields other than personnel management, operating statistics are being pooled frequently and to excellent advantage on the part of those contributing.

2. Suitable operating standards or forms are lacking for the personnel field largely because statistics are not being sufficiently so pooled.

3. Labor turnover is a personnel problem which peculiarly needs such a pool in order to steer clear of misleading fixed norms—

   a. It is demonstrable that these norms are not fixed, but highly variable. Average experience fluctuates up and down with peculiar violence, due largely to changing economic or labor market conditions.

   b. Also the turnover experience of different employers at the same time varies from that of others over so wide a range as to suggest a need for further comparison and study.

4. Employers have an opportunity to pool their labor turnover statistics and to receive in exchange useful monthly comparisons and graphic charts. This service is being offered in cooperation with certain local agencies and the Metropolitan Life Insurance Company.

SAND AND GRAVEL SPECIFICATIONS

THE National Sand and Gravel Association has issued their bulletin Number 3 under the title of Representative Specifications for Different Uses of Sand and Gravel.

The various chapters of this bulletin have been published from time to time in the National Sand and Gravel Bulletin. The reprint combines all the articles with the necessary revisions to bring them up to date.

This bulletin is the third of a series to be prepared by the Engineering and Research Division, designed to furnish information of interest to the users and producers of sand and gravel.

In this bulletin representative specifications for sand and gravel for different uses have been summarized. They have been compiled from a variety of sources and are intended to point out what seems to be the best generally accepted practice in the different fields.

The bulletin was prepared by Stanton Walker, director, and C. E. Proudley, assistant director, Engineering and Research Division.

The sand and gravel industry produced during the year 1927 approximately 200,000,000 tons of material, a quantity which, if loaded at one time, would require more than four times the number of open top cars operated by the railroads of this country.

The growth of the industry during the past few years has been enormous, having increased about two and one-half times since 1920.

The specific requirements for any commercial product are, almost invariably, the result of years of experience and research in the industry which uses the material in question.

In recent years various national and international organizations have been formed for the purpose of bringing into accord the ideas of users and producers of various products and of eliminating erroneous or unnecessary requirements.

Such organizations as the American Society for Testing Materials, the American Concrete Institute, the American Society of Civil Engineers, and various trade organizations have been particularly active in such work. Much of their work has been along lines of interest to the users and producers of sand and gravel.

In Bulletin number 3 the attempt has been made to collect the most recent and authoritative recommendations for specifications for sand and gravel for different uses.

The information presented is not intended to constitute the recommendations of either the National Sand and Gravel Association or the authors. The specifications discussed are intended to point out that seems to be the best generally accepted practice in the different fields.

In presenting the specifications, an endeavor was made to place them in the order of the quantities used in the different industries.

The extensive use of concrete for building and road construction has resulted in more specifications being written and attention being given to their preparation than any other use of the material.

The importance of properly selected and prepared sand has long been recognized and as a result almost every engineer or group of engineers has endeavored to outline their ideas of the requirements of sand to produce concrete of the highest quality.

It has been impractical so far to formulate a single specification for general application covering all the conditions which are met and insure a suitable material.

In this bulletin specifications for concrete sand is a resume of standards of the Bureau of Public Roads at Washington, including a comparison of grading of sand produced in each state.

Practically all of the states require the sand to be free from injurious amounts of organic impurities, as shown by the colorimetric test.

The specifications which have been prepared by the American Society for Testing Materials are of necessity wide in scope and operate more to eliminate from use of sands which are distinctly unsuitable, rather than to select those which are best for the purpose.

Specifications for concrete sand, as submitted by the Joint Committee on Concrete and Reinforced Concrete, composed of representatives of the American Society of Civil Engineers, the American Society for Testing Materials, the American Concrete Institute, the American Railway Engineering Association, and the Portland Cement Association, are discussed.

Gravel has had almost as many different specifications written for its use in concrete as sand.

Practically the same conditions exist with regard to gravel as to sand and the discussion of specifications is almost identical.

Sand and gravel in the field of bituminous highway construction has been thoroughly investigated. Lately attempts have been made to develop more economical construction with the result that a number of state and municipal highway departments have adopted aggregate grading for bituminous mixtures.

It is highly important that the question of proper grading of the aggregate be given due considera-

(*Continued on Page* 67)

EFFICIENT LUBRICATION IN PITS AND QUARRIES

By J. A. Martz

LUBRICATION of equipment is not, after all, such a difficult or intricate problem as is sometimes thought. It is, however, much too important to neglect.

But that is just what has been happening in a great many plants until today. Lubrication has been looked upon as a necessary evil. And inefficiencies in the old lubrication methods have been looked upon as unavoidable because no better methods of handling the problem had come into use.

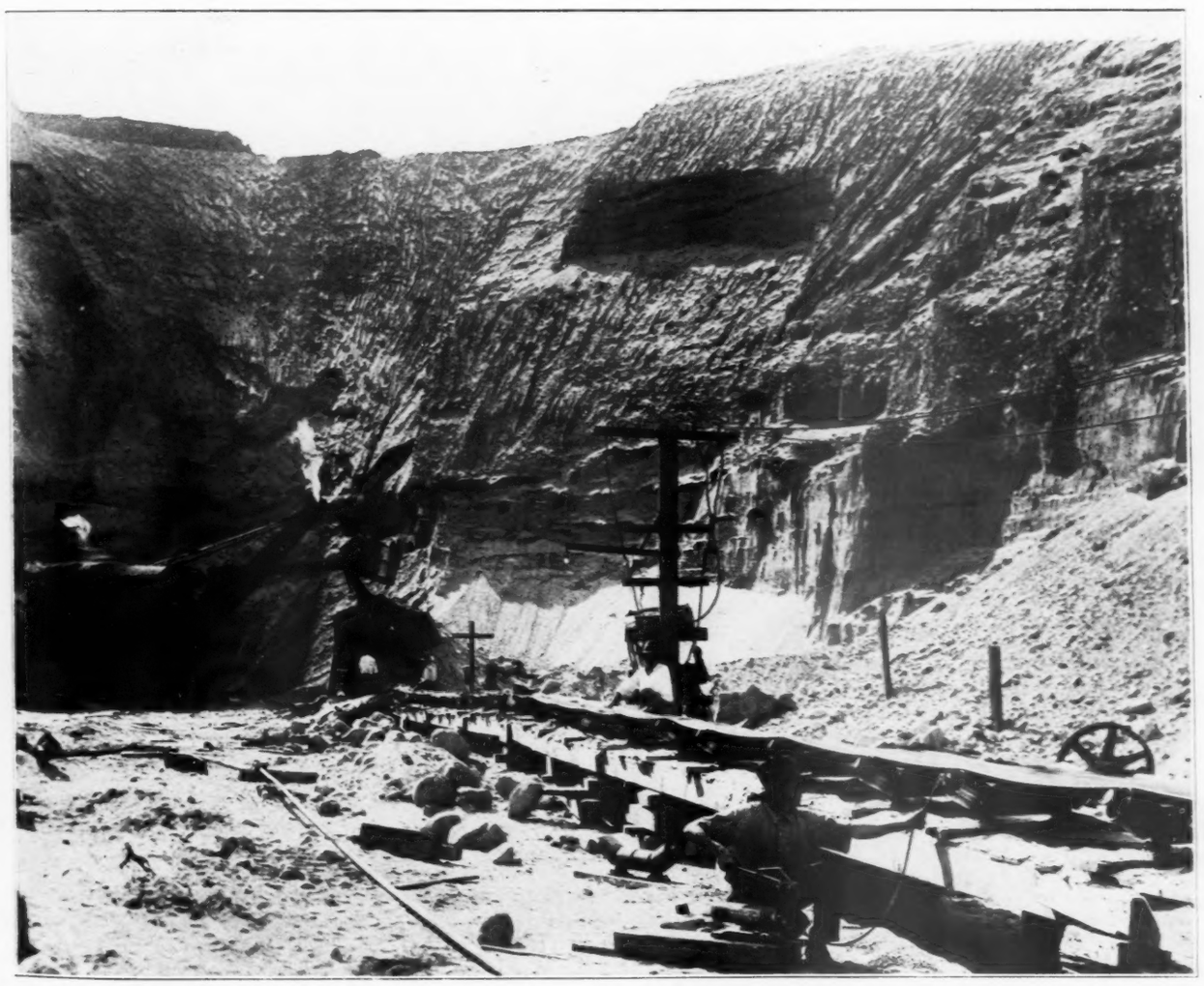
Today, however, when production costs are being more closely scrutinized than ever before, such wastes as those connected with the old lubrication methods are being eliminated.

Plants which have been able to eliminate largely their shutdowns from equipment failures and the high repair costs due to careless lubrication are naturally in position to make better profit than their less fortunate competitors. With proper lubrication a plant can operate with greater speed, and from 25 to 50 per cent longer life is obtainable from each machine. It is also possible to save from one fourth to one half on the labor of lubricating and the cost of lubricants.

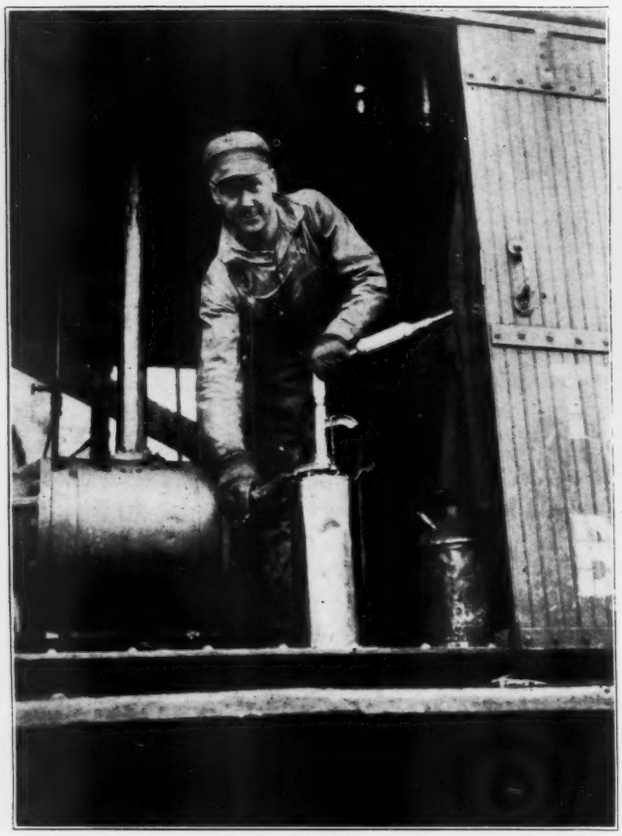
These savings considered separately may not seem large. But, added together over the course of one year or five years, they assume a proportion which may add materially to a company's profits.

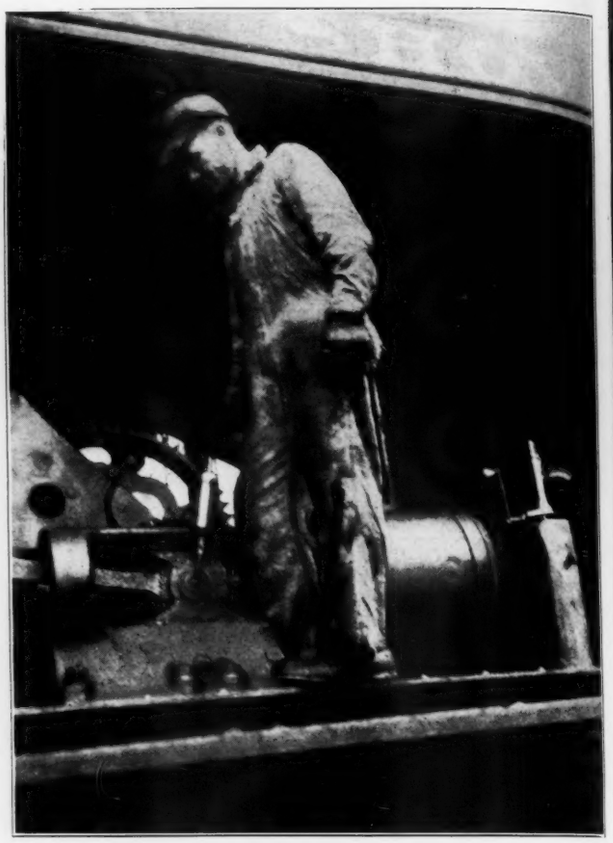
There is no reason why lubrication should be mussy, wasteful and haphazard. Instead of pouring oil in the general direction of bearings, why not force it directly into the bearing where it is needed, and force it in such a way that it cannot go any other place? That would be putting lubrication on a positive, systematic basis.

Then comes the problem of what type of lubricant should be used. There is a vast difference in oils and greases. These differences may not be visible by just looking at the products. Lubricants



The High Pressure Method of Lubricating a Belt Conveyor at the Blue Diamond Quarries near Los Angeles. The Compressor holds five pounds of Lubricant and Develops a Pressure of 5,000 Pounds Per Square Inch.





Ohio Gravel Ballast Company Saves an Hour of Labor a Day Since Adopting the Latest Type of High Pressure Lubrication System. No. 1 Shows How the Compressor Is Applied to the Bearings of a Steam Shovel. No. 2 Shows How the Compressor Is Filled Through Its Handle By a Turn of a Crank.

must be bought by test and experience. When you have tried a lubricant and it does the job, stop experimenting. Accept no substitutes. A better grade of lubricant generally costs less in the long run, because it goes further and actually does the job for which it is intended. No lubricant can be economical unless it does the job satisfactorily.

When you consider the problem from the angle of whether to use grease or oil you must give attention both to means of application and results.

The use of oil means application with the oil can, bottle oilers, drip cups, etc. From a practical viewpoint the efficiency of a sand or gravel plant's lubrication system is inversely proportional to the number of bearings which must be lucricated through open oil holes. By this is meant that the fewer oil holes you have, the better.

Particularly on machinery which is exposed to grit, dirt and weather, oil holes are inadequate. One of the most important elements of lubrication is keeping bearings clean, preventing abrasion by grit and rough surfaces. Oil holes not only admit outside grit, sometimes to the extent of becoming too clogged to admit any oil, but they furthermore do not admit any pressure that could be utilized for flushing the bearing clean at intervals. The same is true to a lesser extent of lubrication systems that do not employ high pressure application.

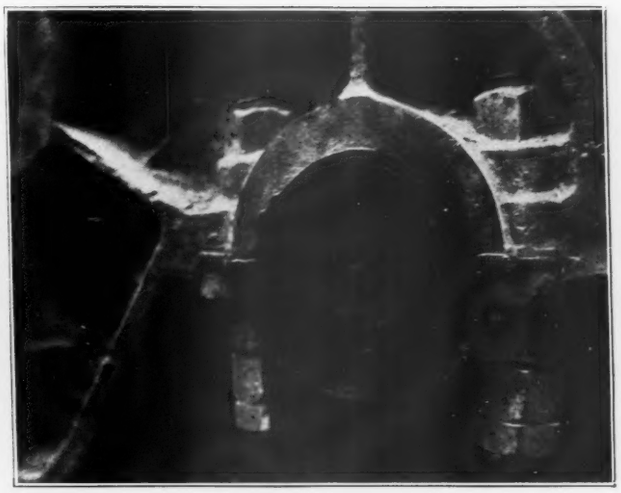
A second difficulty with oil is the waste it involves. Oil drips out of bearings as easily as it drips in. The result is that oil has to be applied frequently and bearings are flooded at the time of application, but soon are drained of lubricant as the oil runs out of the housing. For heavy bearings, too, oil lacks the body necessary to maintain a constant protective film. Frequent metal to metal contact makes necessary early replacement of shafts or babbittings, or both.

Greases offer other problems. In the first place, grease cups develop only fifteen to twenty pounds of pressure. This pressure is utterly inadequate to flush an ordinary bearing. Hence, after the greaseway becomes a little clogged the grease cup is little better than an ordinary half clogged oil hole.

The selection of the proper kind of grease also is a problem. In purchasing lubricants it is well for the buyer to keep in mind that he will get about what he pays for. Greases can be bought from five cents a pound to thirty-five cents a pound. For general purposes it may not be necessary to pay the highest price. But neither can the operator of production equipment afford to hazard his machine by using the lowest priced greases. Twelve to fifteen cents a pound should buy a dependable product. And it is hardly safe to go beneath that price. The savings are small and the differences in results may be very expensive in the long run.

Now for the method of application. Many manu-

A Compressor Which Can Be Operated With One Hand Makes Lubrication of the Boom Easier and Safer for Workmen. Speedy Application Eliminates the Necessity of Shutdowns for Lubrication.



Keeping a Good Grease Seal at the Bearing Ends Keeps Dirt and Moisture Out of the Bearing. Plenty of Pressure Is Needed to Distribute Lubricant Throughout a Bearing of This Size.

facturers of pit and quarry machinery now have Alemite lubrication as standard equipment. This means a definite turn to high pressure lubrication.

Let us see for a moment how this lubrication method works out in the field. Instead of oil holes, oil cups, grease cups or other devices meant to lubricate bearings you have small fittings on all machinery. These fittings do not protrude more than half an inch above the bearing housings and have ball check valves inside to protect the bearings from outside dirt and moisture. Fittings absolutely flush with the housing may be employed if necessary.

Instead of an oil can or a bucket of grease and a paddle the oiler carries only a small compressor with perhaps a convenient supply tank for refilling the compressor without exposing the lubricant. The compressor develops from 500 to 3,000 pounds pressure on the lubricant going into the bearing—enough to force the old grease and grit out the bearing ends. The importance of this flushing of bearings at regular intervals when applying fresh lubricant cannot be overemphasized.

This method of lubrication is now being furnished with most new machines. But it can also be applied to old machinery as well—displacing both the grease cups and the open oil holes.

In general, machines which have to be oiled once or twice daily can be lubricated satisfactorily by applying a system of this sort once a week. A complete filling of each bearing is assured and solidified lubricant stays on the job.

This type of lubrication is especially adapted for ball or roller bearings because it gives more assured protection to the metal surfaces. Belt conveyors with ball and roller bearings can be lubricated adequately with two to five applications a year. Besides the actual application is much faster than the old methods.

$15,000,000 Loan for Public Works In Colombia

The President has signed a law, No. 73, which authorizes the Government to contract "in the name of the nation" a loan totaling $15,000,000 for the following purposes: Water supply, sewerage and paving of Bogota, $9,000,000; sewerage and paving of Barranquilla, Cartagena and Santa Marta, $3,000,000, $2,000,000 and $1,000,000, respectively. (H. Freeman Matthews.)

(*Continued from Page* 64)

tion as the stability of bituminous mixtures depends largely on the size of the aggregate particles and the amount of voids in the compressed aggregates.

The recommendations of specifications for sand and gravel in this field of the American Society for Testing Materials and the Asphalt Association are similar.

One chapter is devoted to miscellaneous uses of sand in highway construction.

Sand for use in building construction includes specifications for sand used in plaster, brick mortar, stucco, and finishes of similar nature.

The Committee on Ballast of the American Railway Engineering Association, in cooperation with the Washed Gravel Ballast Committee of the National Sand and Gravel Association, have prepared a specification covering grading, cleanness, and methods of testing gravel for ballast.

The final chapter covers sand and gravel for miscellaneous uses under heads of filter sands, filler gravel, foundry sands, glass sands, sands for polishing, grinding and abrasive and engine sands.

Copies of Bulletin number 3 may be had upon request by addressing the National Sand and Gravel Association, Inc., Munsey Building, Washington, D. C.

UNIVERSAL GYPSUM AND LIME COMPANY ADOPTS SIMPLIFIED METHODS OF TRANSPORTATION

THE Universal Gypsum and Lime Company has established a system for handling material directly from the mine to the point of ultilization in the plant on its Akron, New York, property that has several interesting features. The gypsum is won from a vein about 4½ feet deep and of considerable area, located about 68 feet below ground level, so that operations are carried on by straight mining, the room and pillar method being used. The plant proper, which is partly devoted to the manufacture of wall board and partly to that of other products in which gypsum is used, is built directly over the head shaft of the mine, so as to eliminate all carriage of material above ground, or for that matter, any rehandling. The material from the work faces is brought to the head shaft, crushed, and delivered to storage bins in the plant by a system of simple, and comparatively inexpensive material handling operations, which is arranged to function substantially as follows:

The mine is served by a fleet of 250 Timken-equipped mine cars, and two electric mine locomotives, which are used to haul the material from the working faces to the tipple, or car dumper, at the head shaft room. The cars are of simple construction, the body consisting of a plain sheet steel box, supported by four dead axle cannon box wheel mountings. The bearings are applied in the standard Timken mine car mounting and the outer closures are designed to form especially tight seals against the entrance of moisture or grit. The cars are equipped with solid steel bumpers fore and aft, and, instead of couplings, are connected by a stout three link chain, for reasons which will shortly appear. They have a load capacity of 1.5 tons each, and a tare of about 1,000 pounds.

Empty cars are made up in trains of 40 or more, and hauled back by one locomotive, while the other is delivering a full train to the head shaft room. The empties are spotted in groups at entries, and pushed into the working faces by hand. Having been loaded, they are pushed out to the entry,

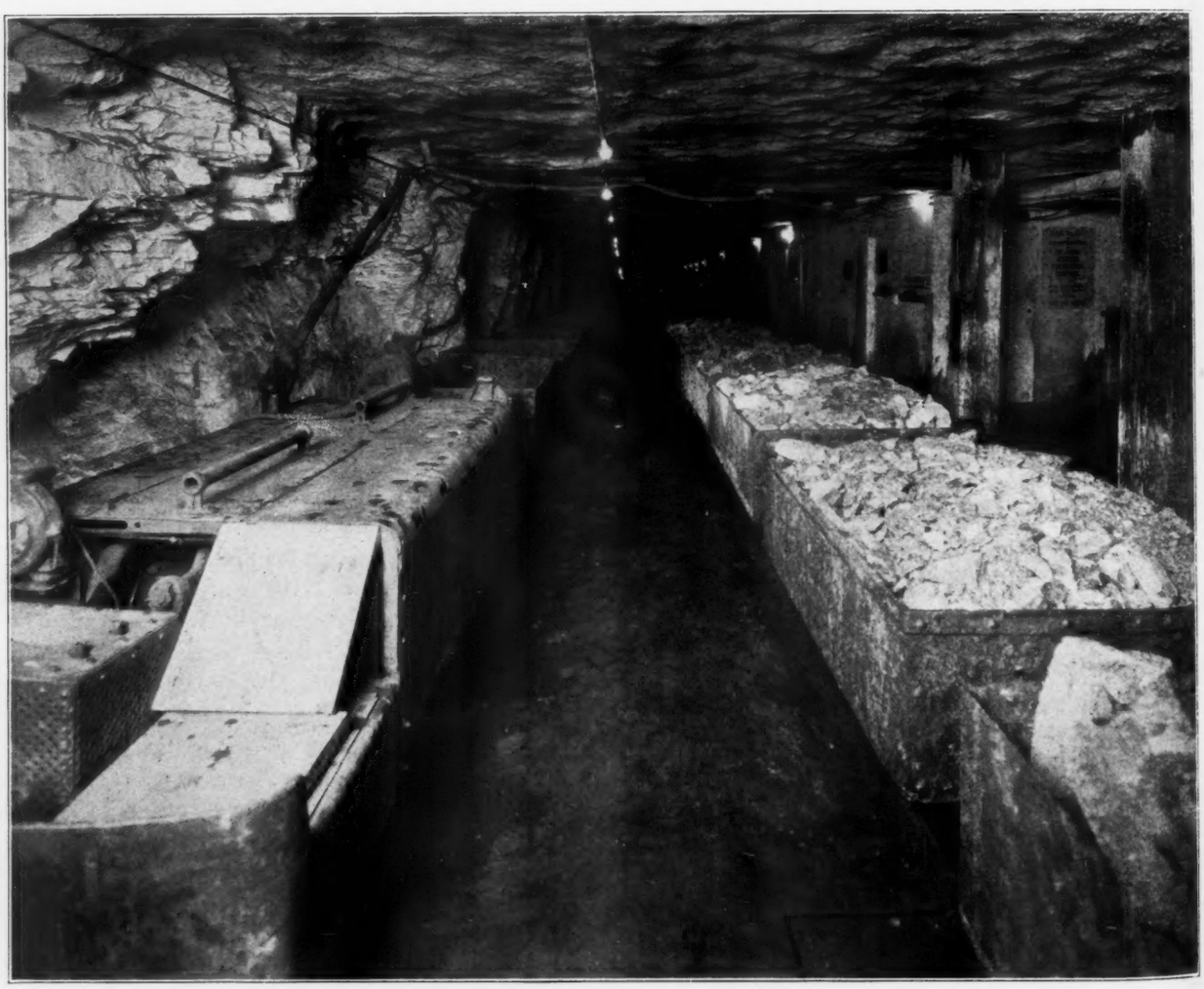


Figure 1—The Mine Head With a Loaded Train Arriving and an Empty One on Its Way Back for Distribution to the Entries

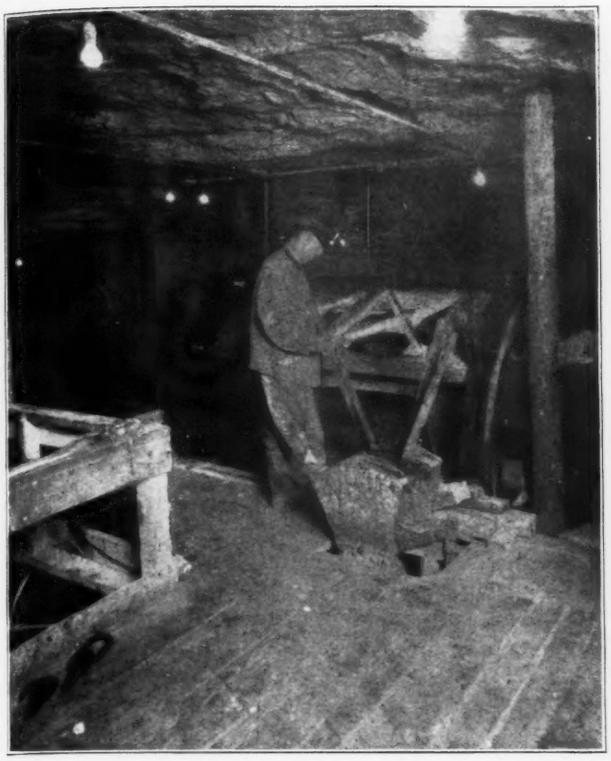


Figure 2—The Car Dumper in Operation, Showing the Simplicity and Centralization of the Control. The Push Button Station for the Conveyor Motor Can Be Seen on the Guard Rail to the Left.

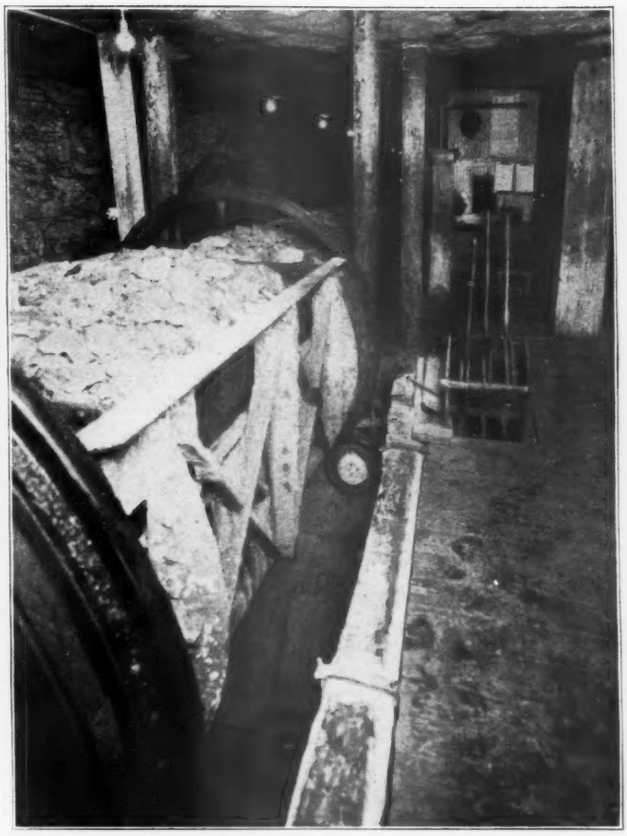


Figure 3—A Close-up of the Car Dumper Showing Its General Construction, and One of the Tapered Roller Bearing Trunnions on Which It Revolves.

where they are picked up by the locomotive for delivery in trains to the head shaft. When the loaded train arrives at the delivery point the preceding train may or may not be completely unloaded. If the latter is the case, the first car of the incoming train is hooked to the last car of the train in process of unloading, to form a continuous string. The empties are picked up by the locomotive that has just delivered its train, and hauled back to the entries. A good idea of the process can be obtained from Figure 1, which shows the head room with a loaded train just arrived, and an empty one ready to leave.

The method of unloading is interesting because of its simplicity and effectiveness, a general view of the process being shown in Figure 2. After passing over the weighing scale, the incoming tracks lead over a car dumper, which consists of a steel frame cradle, with large ring rollers on each end. The rollers are each mounted on two trunnions which are equipped with Timken bearings, and that nearest the control levers is provided with a band brake. A good idea of the construction of the dumper can be obtained from Figure 3.

The operation of the dumper is as follows: The cars in the train are pulled on one at a time by a stationary winch, or car puller, driven by a 15 h.p. motor through a clutch that is controlled from one of the levers at the operators stand. Since the cradle, or dumper, is off center, releasing the brake causes it to roll over, carrying the car with it, and dumping its load on the conveyor below. The car being connected to those in front and back of it by a chain, it is free to turn without disturbing the other cars, and the torsion developed in the chain is sufficient to hold it in position in the cradle.

As the cradle comes down it hits a spring stop, and, still being off center, it returns automatically to its former position, being held in place by the operation of the brake. The whole operation, as can be seen from Figure 4, is controlled by one man, and can be made as slow or rapid as desired, the only limitation to its speed being the time necessary for the cradle to roll over and return to its former position. As a matter of fact the average amount of material handled runs between 800 and 1,000 tons in a day of 8 hours.

The material from the cars is dumped directly onto a steel platform conveyor that carries it up a short incline directly to the crusher hopper. The control for the conveyor drive, consisting of a push button start and stop station is also located within easy reach of the dumper operator, so that control of every unloading operation is centralized at one point. As a result, the operator can maintain a steady flow of material to the crusher, and can prevent its overloading by regulating delivery to the hopper as circumstances demand. The crushed material is delivered to a belt conveyor, running at right angles to the hopper conveyor, that delivers it

Figure 4—One of the Cars in a Train in Process of Being Unloaded. The Illustration Shows the Method of Connecting the Cars, and Their Condition Shows the Hardships Under Which They Work.

to an elevator boot. From here a bucket elevator carries it to the storage bins in the building above.

While the system as a whole is simple, it is effective, and is inexpensive to operate, especially as far as labor is concerned. All the latter necessary is one man on the weighing scales, one to control the operation of the car dumper, crusher feed, and train movement, and one for general supervision of the material movement between the crusher and the elevator boot. In connection with the economy of operation, some interesting facts have developed in regard to the influence of the bearings with which the cars and dumper are equipped on this particular factor. It so happens that the present equipment replaces some exactly similar in quantity and construction that was not Timken-equipped, as a result of which it has been possible to make an exact comparison of the relative operating economies of the two. As far as the car dumper is concerned, before the roller bearings were installed the dumper was tipped by power, and it took three men to right an empty car after tipping. The comparative economy of the present system, where both operations are done by gravity and controlled by one man, who never has to touch the dumper, is obvious.

As far as the cars themselves are concerned, the facts are even more remarkable. Formerly, out of a fleet of 250 cars there were always anywhere from 60 to 65 out of service for repairs, as a direct result of bearing trouble. In addition, there was a more or less continuous succession of wrecks in the mine caused by the sudden failure of bearings, or of wheels worn because of faulty bearings. In the length of time that the cars have been in service with their present bearing equipment, there has been no expense for repairs, or other trouble that could be directly traced to the bearings. This record is particularly remarkable when one considers the severity of the conditions, both with regard to the continual presence of moisture, and to rough handling, under which the cars operate.

There has also been a decided reduction in operating expenses, both for labor and for lubrication. For one thing, mining costs have been cut because fewer push men are required than formerly, and the roof does not have to be brushed as often because the men will push the cars further than they would, or could, previously. As to lubrication, the cars are now lubricated twice a year, and they are inspected at the same time. So far, the inspection has been a formality—no servicing being necessary. With the former equipment, servicing was a continuous process, and so was lubrication. Reduced to labor costs, it can be expressed as follows: Formerly there were two full time men at 50 cents an hour engaged in servicing the cars, in addition to which were a blacksmith and helper one half time at a combined cost of $1.30 an hour. Altogether it cost about $99 per week to keep the cars moving. At present one man, at 60 cents per hour spends less than ten hours a week on service, which includes lubrication. To put it briefly, general maintenance costs have been cut 90 per cent, including the expense for lubricant. When the increased volume of material that can be moved, owing to the fact that all the cars are giving continuous service, is considered, it can easily be seen that the benefits resulting from the use of tapered roller bearings have been decidedly material, from every standpoint.

Highway Construction In British Columbia

It is reported that the Government of British Columbia will shortly borrow $4,000,000 to be devoted to the construction of new highways and the repair of existing roads in the Province, in 1929. It is understood that the new construction will be confined largely to the Fraser River Valley, in order to give the farmers in that large agricultural district easier access to the commercial center of the Province, and also to divert a substantial amount of automobile traffic from American cities near the border on Sundays and holidays. It is also anticipated that the improved highway will induce American tourists to penetrate further into the Province of British Columbia. According to reports, nothing will be done toward the completion of the large construction projects initiated last year, viz., the highway through North Thompson Canyon to Jasper and the Big Bend of the Columbia River, and westward from Jasper to Prince Rupert; also the west coast highway on Vancouver Island. Road construction in British Columbia is financed by receipts from the tax on gasoline.

NEW YORK STATE SAND AND GRAVEL PRODUCERS HOLD ANNUAL CONVENTION

THE third annual convention of the Empire State Sand and Gravel Producers' Association, held at Rochester on December 20, proved an entertaining and successful affair. Three sessions were held at the Sagamore Hotel during the day. The closing session followed a dinner at the Rochester Club in the evening, at which prominent state and city officials were guests.

Members and guests attending, numbering over 100, included Stanton Walker, Engineer of the National Sand and Gravel Association, Washington; Stephen B. Story, City Manager of Rochester; H. E. Smith, Division Engineer of the State Highway Department, and F. M. Welch, Engineer for American Aggregates Corporation.

This Association was organized at Syracuse, January 8, 1926, and now has an active membership of about 50. Firms selling machinery and equipment to the industry have been admitted to associate membership during the past year.

About a dozen of these firms participated in a machinery exhibit, offering literature and exhibiting small machinery and models. They have made an excellent beginning, and this feature is bound to grow in importance and interest.

There was a general get-together session at 10 o'clock in the morning, and an informal business meeting was held at noon to receive the reports of officers and committees.

In his report, Secretary-Treasurer John G. Carpenter enumerated a long list of activities, including letters to several hundred consumers of aggregates, stressing the merits of gravel; numerous bulletins issued to members and widely distributed among producers and officials; convention in January and three meetings of the Association; secured improvements in methods of inspection of aggregates by State Highway Department; promoted a uniform term of credit to contractors, involving the solution of the collection problem; encouraged closer cooperation with the Highway Contractors' Association and the Crushed Stone Association; handled many freight rate matters and advocated uniform rates on sand and gravel; secured a decision from the Trunk Line Association that crushed gravel should be classed as gravel and not as crushed stone under the usual freight tariffs; visited the majority of the plants in the state during the year, and assisted many producers in solving individual problems; made a membership drive which had resulted in the addition of about a dozen new members; and suggested a program for the coming year that involves enlargement of the activities of the Association.

As treasurer, Mr. Carpenter reported scarcely a third of the income had been expended, and that the Association now has a balance of approximately $900 in money and property.

The policy and program for the coming year was generally discussed, and referred to the Executive Committee.

The afternoon session opened with a luncheon given by the associate members. The program was in charge of the secretary-treasurer, John G. Carpenter.

"Activities of the Research Division of the National Sand and Gravel Association," by Stanton Walker, engineer in charge, described the activities of the laboratory and its importance to producers, and the efforts of the National Association to secure uniform specifications and gradings.

"Lengthening the Building Year," by William Burdick, secretary of the Community Conference Board of the Rochester Chamber of Commerce, explained that for several years this Board had been working on the plan which seems about to become a national undertaking, by encouraging building in slack times. Under this plan the Chamber of Commerce, through a general questionnaire, has ascertained what building is in prospect, and has encouraged the prosecution of the work during the winter months and at other times when there were indications of business depression. This movement, when offered by President-elect Hoover, carried a headline, "Insurance Policy Against Hard Times."

"Pre-qualification of Bidders on Public Work," by Harry R. Hayes, engineering secretary of the State Highway Chapter of the American Road Builders' Association, Albany, presented a plan which is being furthered by the Highway Chapter to secure a more effective prosecution of public building by requiring a definite standard of efficiency and responsibility from contractors. He gave several illustrations of great losses to the state through inefficiency and delays, and stated that a large majority of the contractors approved the proposed plan.

In a short talk on the construction and operation of large plants, F. M. Welch, engineer for the American Aggregates Corporation, stated that his firm is operating about 25 separate plants and producing about 5,000,000 tons of aggregates per year. He stated that this business required a manufacturing plant to provide machinery and supplies, and outlined the production of sand and gravel on a large scale. He announced that in a vast majority of cases in the Middle West, the chances of a fair profit depended entirely upon mass production.

At this point Mr. Carpenter introduced Col. Nathan Shiverick of Avon, and suggested that he give "First Impressions of Sand and Gravel Production." Mr. Shiverick owns several large deposits, and is contemplating the erection of a large modern plant.

The regular business meeting was held at 4 p. m., with President Hyman presiding. The following officers were elected: president, Henry F. Marsh, Consolidated Materials Corporation, Rochester; vice-president, C. W. Maxwell, Albany Gravel Company, Albany; secretary-treasurer, John G. Carpenter, Madison Sand and Gravel Corporation, Hamilton. The Executive Committee will comprise the above officers and John A. Taylor, of the Valley Sand and Gravel Company, Rochester, and H. A. Stelley, of the Buffalo Gravel Company, Buffalo.

It was suggested that the next meeting of the Association be held at Syracuse in March, and that an effort be made to have the New York State Highway Chapter and the New York Crushed Stone Association meet on the same day.

The secretary-treasurer was presented with a check for $100 as an expresson of appreciation for his services.

The dinner given by the Valley Sand and Gravel Corporation and the Consolidated Materials Corporation at the Rochester Club at 6:30 p. m., was attended by practically all of the visitors, and proved a most enjoyable and instructive affair. Considerable amusement was created by the menu, prepared by the secretary, which included such dishes as "workable slump," "Field mix," "coarse aggregates," "nuggets," "reinforced concrete," and "deleterious substances."

Secretary-Treasurer John G. Carpenter presided. At the speakers' table were Stephen B. Story, city manager; Henry L. Howe, engineer of Design and Construction of Rochester; Stanton Walker, engineer and director of Research Laboratory of the National Sand and Gravel Association; George E. Schaeffer, president of the New York State Crushed Stone Association; E. R. Crofts, engineer for the Rochester Gas and Electric Corporation, and David Hyman, president of the Buffalo Gravel Company.

On account of a sudden call to Albany, Division Engineer H. E. Smith of the Rochester Division of the Highway Department was unable to be present. Letters of regret were read from Hon. Arthur W. Brandt, Commissioner of Highways, New York; Hon. Charles Cadle, former State Engineer; and H. E. Hopkins, editor of "Cement, Mill and Quarry." Each promised to attend the next convention.

"General Activities of the National Sand and Gravel Association" was ably presented by Stanton Walker, engineer for the Association. He stressed the importance of the activities of the Engineering Division, and announced that the results of these activities were largely printed and would be presented to any interested producer upon request. He also called attention to the National convention of the Sand and Gravel Association, to be held at Cleveland on January 9, 10 and 11, and urged all producers to attend. Mr. Walker also explained how the National Association is solving the problems which perplex producers, and advised them to keep in touch with research agencies, and told how reports of this work could be procured.

Henry L. Howe, engineer of Design and Construction for the City of Rochester, speaking on the subject "Silt—Its Effect in Concrete," stated that the lack of a certain quantity of silt weakened concrete, while an excess of silt accomplished the same result, and asserted that within certain limitations, the presence of silt in concrete aggregates was not injurious. He stated that several manufacturing firms had advocated the use of hydrated lime and similar substances to increase the plasticity of concrete mix, and asserted that this was unnecessary if a slight percentage of silt were left in the aggregate, probably one per cent.

The subject "Sand and Gravel in Power Dam Construction" was ably and interestingly handled by E. R. Crofts, engineer of the Rochester Gas and Electric Corporation. He enumerated briefly the development of the company's water rights along the Genesee Valley and the recent construction of the extensive Canadea Dam near Hornell, New York. The main point of his talk was confined to the proposed dam at Mt. Morris, 25 miles south of Rochester, will be 210 feet high and will require 400,000 tons of aggregate. After outlining the plan of this vast piece of construction work, he quietly reminded the producers that the production of elec-

Partial List of Those Who Attended the Convention

Stanton Walker, National Sand and Gravel Association, Washington, D. C.; Henry L. Howe, Director of Design and Construction, Rochester; F. M. Welch, Chief Engineer, American Aggregates Corporation, Greenville, Ohio; Stephen B. Story, City Manager, Rochester; Frederick W. Burton, Manager Transportation Bureau, Chamber of Commerce, Rochester; Homer W. Storey, Valley Sand and Gravel Corporation, Rochester; B. G. Lucas, Valley Sand and Gravel Corporation, Rochester; John A. Taylor, Valley Sand and Gravel Corporation, Rochester; John F. Ancona, Engineer, Rochester; H. W. Butler, Whitmore, Rauber & Vicinus, Rochester; Charles H. Imson, Equipment, Rochester; Albert C. Wood, Bennett & Wood, Inc., Rochester; Fred C. Line, Department of Public Works, Rochester; John P. Larsen, New York State Department of Public Works, Rochester; Fred R. Bemish, Bureau Design and Construction, Rochester; F. J. Reichenberger, Bureau Design and Construction, Rochester; H. R. Moulthrop, Bureau Design and Construction, Rochester; James E. Kelly, Senior Assistant Engineer, State of New York, Rochester; Roy P.

Warren, Civil Engineer, Rochester; H. Walter Hughes, Supervisor Division of Tests and Materials, Rochester; Eugene T. Pope, Bureau of Design and Construction, Rochester; George R. Newell, Civil Engineer, Rochester; George C. Wright, County Superintendent of Highways, Rochester; C. W. Maxwell, Albany Gravel Co., Albany; Ray W. Wingate, Alfred Atlas Gravel and Sand Co., Alfred; Leonard Claire, Alfred Atlas Gravel and Sand Co., Alfred; A. Nagel, N. J. Wire Cloth Co.; George G. Miller, State Department of Public Works, Rochester; Fred C. Tacer, State Department of Public Works, Rochester; H. L. Michael, State Department of Public Works, Rochester; R. C. Brotsch, Consolidated Materials Corporation, Rochester; W. A. Flynn, Valley Sand and Gravel Corporation, Rochester; V. J. Milkowski Morris Machine Works, Baldwinsville; Edward G. Stallman, Valley Sand and Gravel Corporation, Rochester; R. P. Holdubaum, Webster Manufacturing Co., Buffalo; H. A. Stelley, Buffalo Gravel Corporation, Buffalo; George E. Priest, Rib-Stone Concrete Corporation; E. A. Allison, Olean Sand and Gravel Co., Machias; N. S. Snyder, Link-Belt Co.; Grant Ellen, W. S. Tyler Co.; Alexander Russell, Rochester and Lake Ontario Water Service Corporation, Rochester; M. M. Reynolds, Sand and Gravel; J. R. Norton, Smith Engineering Works, New York City; E. R. Crofts, Rochester Gas & Electric Corporation, Rochester; Henry F. Marsh, Consolidated Materials Corporation, Rochester; David Hyman, Buffalo Gravel Corporation, Buffalo; George E. Schaefer, New York State Stone Association; John G. Carpenter, Madison Sand and Gravel Corporation, Hamilton; Harold Baker, Commissioner of Public Works, Rochester; W. D. Guiney, Victor Balata and Textile, Buffalo Belting Co.; Thomas MacLachlan, Vulcan Iron Works, New York City; Frank D. Manning, Osgood Company, New York City; E. A. Allison, Olean Sand and Gravel Co.; J. E. Orebaugh, Marietta Concrete Corporation, Marietta, Ohio; Nathan Oaks, Nathan Oaks & Sons, Oaks Corners, N. Y.; Carlton V. Oaks, Nathan Oaks & Sons, Oaks Corners, N. Y.; Col. Nathan Shiverick, Prospective Producer, Avon, N. Y.; H. S. Hutcheson, 114 Grace Ave., Newark. N. Y.; A. E. Fielding, Niagara Screens, Buffalo; Harry R. Hayes, New York State Highway Chapter, Albany; E. P. Forestell, New York State Highway Chapter, Buffalo; George W. Chambers, New York State Highway Chapter, Rochester; F. J. Collins, Dale Engineering Co., Rochester; John B. Ehrhart, Rochester Vulcanite Corporation, Rochester; Gus Rogers, Allentown Portland Cement Co.; B. G. Perlberg, Wheeling Mould & Foundry Company, New York City; F. J. Wolder, Barr & Creelman, Rochester; L. M. Beattie, Valley Sand & Gravel Corporation, Rochester; E. W. Foote, Rock-Cut Stone Co., Syracuse; F. A. Risley, Madison Sand & Gravel Co., Binghamton; Sanford Smith, Highway Department, Rochester; F. H. Elam, Elam Sand & Gravel Corporation, Rochester; E. G. Cole, Democrat & Chronicle, Rochester; John V. Lewis, Department of Public Works, Rochester; Wm. C. Long, Madison Sand & Gravel Corporation.

Slate Industry Conference

The Annual Conferences of the Slate Industry will be held in New York City a tthe Commodore Hotel, January 14th to 17th, 1929. Business conditions in the Slate Industry are good. In general this condition is attributable to the constant efforts of the various factors of this Industry to continually improve and develop present markets and to diligently search for new uses of slate.

The National Slate Association was created for that purpose and in eight years has steadily grown in membership from 17 to 225, a splendid achievement in itself. The most outstanding element in this growth is not perhaps as much numbers as the type of membership!

The producers or quarries of slate, the distributors, the roofing contractors, the setting contractors and the members of the hosts' club—manufacturers of equipment and supplies used by the industry—an organization assisting in the complete development of this industry by serving wherever and whenever possible to bring about new developments in production, manufacture and selling of slate. All are in thorough accord, feeling that the key to better conditions in their industry lies in greater service to the public.

Increase in production and sales of slate are shown by the latest figures from the Department of Commerce, "Slate in 1927," as compared to 1921.

	ROOFING SLATE		MILL STOCK		OTHER USES	
	Squares	Value	Square Ft.	Value	Value	TOTAL
1921	348,085	3,197,745	8,970,000	2,719,723	1,404,538	7,322,006
1927	463,560	4,949,940	9,287,680	3,519,386	2,911,410	11,380,736

The conferences will open on Monday morning, January 14th, with the assembly and registration of the roofing contractors, immediately followed by luncheon and business sessions of the Roofing Contractors' Division of the National Slate Association. At 6 p. m. the officers and directors of the Association will convene for a dinner meeting.

On Tuesday, January 15th, will come the annual business meeting and luncheon of the active members and contributing distributor members, at the Yale Club. Meanwhile, at the Commodore will be held group meetings of roofing contractors, setting contractors and slate salesmen. These meetings will be followed by a general luncheon and assembly for an inspection trip of slate installations in and about New York.

Wednesday morning, January 16th, the Setting Contractors will hold a division organization meeting and the various other groups will continue informal meetings. In the afternoon will occur the first general meeting of the entire industry for discussion of various proposals of the several groups and general action o nmerchandising and sales promotion subjects. Following the general business sessions of the entire industry the annual dinner and theater party will be held.

Thursday, January 17th, at 9:30 a. m., there will be a joint meeting of the entire industry with the Slate Committee D-16 of the American Society for Testing Materials, with Professor W. E. Plank of Lafayette College as chairman. This session will be devoted to production, application and other technical problems of slate quarrying, milling and utilization. The Hosts' Club, associate members of the National Slate Association, will be hosts at a luncheon to the industry, at 1 p. m. Thursday.

Economics Conditions and Forecast

By William F. Whiting, Secretary of Commerce

Some of the more important economic forces which dominate the business situation as we enter the New Year are credit conditions, the degree of accumulation of merchandise stocks and of speculation in them, the size of the crops and of our current industrial output, the rate of wages and volume of employment, and the prospects of foreign trade.

With respect to credit conditions 1928 has been an extraordinary year. The outflow of gold which began in the autumn of 1927 continued during the first half of 1928 and caused a reversal in the easy money situation that had prevailed for several years. Public attention has been fixed on the rise in the rates on stock exchange 90-day time loans from 4¼ per cent in January to 7½ per cent in the early autumn and the even greater rise in call money rates. It is well, however, to note that bank credit for commercial purposes has been in ample supply at rates ranging from less than ½ per cent higher in southern and western cities to slightly over 1 per cent in New York City, while open-market rates for commercial paper have increased by only 1½ per cent during the year.

Agricultural output during the past year was about 5 per cent larger than in 1927 and there was an even greater expansion in manufacturing production, but neither stocks of raw materials nor of manufactured goods have shown any general tendency to accumulate. There is no considerable speculation in commodities and wholesale prices average about the same as a year ago.

Wages continue at a high level and unemployment has been reduced to a minimum. There has been a continued demand for additional workers by mercantile establishments, hotels, and the automotive industry and factories have once more been increasing the number on their payrolls. Labor conflicts in the coal and cotton textile industries were settled during the past year and relations in most sections of the labor world are now amicable.

Activity in the automotive and construction industries has been sustained and is particularly noteworthy. Automobile production has been at a higher level in recent months than at any earlier period and contracts for future construction have been substantially greater than in the corresponding period a year ago. Production of many related products, such as iron and steel, cement, gasoline, and rubber tires has been stimulated as a result of these developments. The textile and coal industries, however, still lag behind the others.

Foreign, as well as domestic, demand for the products of our farms and factories is steadily expanding. During the past year there has been an exceptionally large growth of our exports of finished manufactures—especially automobiles, machinery and petroleum products.

In general it may be stated that both industry and trade are exceptionally active as we enter the New Year.

A Review of Conditions

Generally speaking, the year 1928 has been a period of accomplishment and prosperity. Considerable unemployment and dullness in trade marked the opening weeks of the year and some apprehension concerning the economic outlook was felt.

Spirited activity in practically all lines in the early spring accelerated the movement of business projects. Unemployment soon began to disappear and the general tone of business improved steadily as the year progressed.

The usual flattening of the business curve during the summer months was conspicuous by its absence and business continued through the fall and winter months with healthy vigor not materially lessened during the period incident to the presidential election. There has been only a slight letup, hardly noticeable, for two or three weeks previous to the holidays.

The year, accordingly, closes much more brilliantly than it opened.

Much sober thought is being given to the course that business will likely take in the new year. During these first few weeks there may be a slight laxness, which is only a normal expectancy.

Labor has never been more efficient, nor have real wages been as high as at the present time, and the relationship between employer and employee has never been more friendly and peaceful.

There is a slight overproduction in some lines, but this will be absorbed early in the new year.

Corporations for the most part are not borrowing heavily, the majority of them being in a good cash position.

Earnest consideration is being given to volume production and attention is being focused on the reduction of overhead to increase profits.

There is no evidence of price inflation, generally speaking.

There is very little to indicate a downward movement in the business cycle.

There are sufficient stimulating factors to indicate that trade and industry during the first half of 1929 will hold closely, if not exceed, the level which prevailed the last half of 1928.

Business as a whole continues in large volume and shows a marked gain compared with this time last year.

Production schedules in many lines of industry for the new year are heavy.

INVESTIGATING THE PHYSICAL PROPERTIES OF CAST STONE

A TOTAL of 44 samples of cast stone made by 21 manufacturers scattered through the United States have been collected in the study of the properties of this material which is being made as a basis for the preparation of a federal specification.

The following is the procedure of testing each sample:

(1) Six 2 in. by 2 in. cylinders and three 1 in. by 1 in. by 8 in. prisms are cut from the specimen.

(2) These are dried at 110°C. to a constant weight, which usually requires 48 hours.

(3) Modulus of rupture measurements are made on the prisms, using a 6 inch span.

(4) Three of the broken halves of the prisms are weighed, totally immersed in water and the rate of absorption determined over a period of 48 hours. The specimens are then boiled five hours and assuming that the pores of the specimen are filled with water the porosity is determined.

(5) Compressive strength is determined on three 2 in. by 2 in. cylinders.

(6) The remaining three 2 in. by 2 in. cylinders are subjected to alternate cycles of freezing and thawing in water at 21°C., the specimens being immersed for 48 hours previous to the first freezing. The specimens are kept immersed in ¼-inch of water at the beginning of each freezing cycle.

Stress-strain readings have been made on a number of 2 in. by 2 in. by 4 in. prisms, where the material in the sample was sufficient to obtain the extra specimens.

The range of the values obtained so far are as follows:

	Maximum	Minimum
Compressive strength lb./sq. in., of 2 in. by 2 in. cylinders	10,300	2,370
Modulus of rupture, 1 in. by 1 in. bar on 6 in. span	1,575	375
Absorption, 48 hrs. in water at 21 deg. C. by wt. per cent	10.8	3.3
Absorption, same as above, followed by 5 hr. boiling, per cent	14.6	7.3
Porosity—per cent by volume	33.8	16.0
Secant modulus of elasticity at 50 per cent compressive load, lb./sq.in.	3,300,000	1,400,000
Cycles of freezing and thawing to cause failure	380	62

Strength of Large Concrete Cylinders

A group of over 500 test cylinders of concrete containing large sizes crushed stone as the large aggregate and screenings from crushing the stone as the fine aggregate, representative of the material used in the Santeetlah Dam, S. C., were tested in compression at the approximate age of 3 months. The cylinders varied from 2 to 36 inches in diameter and the height was equal to twice the diameter. The largest size aggregate present in the 36-inch cylinders varied from ⅜-inch to 10 inches. As the cylinder diameter was decreased the largest size aggregate present was reduced.

Another group of cylinders, including specimens of every size, was made in the proportion of 1 part cement to 2.7 parts of aggregate, all aggregate having been smaller than the ⅜-inch sieve. In this group the 36-inch cylinders developed an average compressive strength of 2,550, the 12, 18 and 24-inch specimens approximately 3,000, the 6 and 8-inch specimens 4,100 and the 2 and 3-inch specimens approximately 5,100 pounds per square inch.

In the other groups of cylinders, the 36-inch cylinders contained aggregate of maximum size varying from 2½ to 10 inches, proportions being approximately 1:3:3, 1:3:4. and 1:3:4.6. Before filling the 8-inch molds, all aggregate above 2½ inches was removed from the concrete, for the 6-inch molds all above 1½ inches, and for the 2 and 3-inch molds all above ⅜ inch. The strength of the 36-inch diameter cylinders varied from 1,500 to 3,100 pounds per square inch, compared with the minimum and maximum average strength of 2,260 and 4,400 for the 8-inch and 3,130 and 4,700 for the 6-inch cylinders. There was a general tendency for the smaller specimens to give higher strengths.

Stress-strain readings were taken on the 18 and 36-inch diameter cylinders, readings being taken without stopping the application of load. The readings were continued until maximum load was reached. The ultimate strains varied from 0.0015 to 0.0032 inch per inch, and the initial modulus of elasticity varied from 2,200,000 to 3,600,000 lbs. per sq. in. In all cases the average modulus for the 36-inch cylinders was higher than for the 18-inch cylinders.

A small amount of data of interest was obtained on the rate of deformation of cylinders during test. The rate of deformation of the cylinders tested is very slow at first, gradually increasing in value, becoming practically constant and remaining so throughout the greater part of the test. With an idle head speed of 0.055 inch per minute the head speed was slowed down to .04 inch per minute during tests of 6-inch cylinders capped on both ends with plaster of Paris, the deformation of the specimen being about .0037 inch per foot per minute. When cylinders with ground ends without caps were tested the head speed was slowed down still further to aproximately .02 inch per minute, and the rate of deformation of the specimen was about .007 inch per foot per minute.

*Publication approved by the Director of the Bureau of Standards, of the U. S. Department of Commerce.

PIT AND QUARRY FOREIGN DIGEST

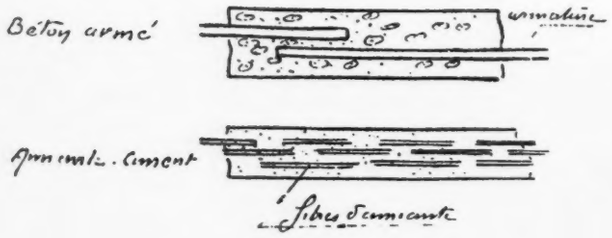


Figure I

Asbestos Cement

As is obvious from the name, asbestos cement is made from asbestos and Portland cement. Asbestos is a mineral product belonging to the serpentine family. It does not exist in only one variety but in many, and from a mineralogical point of view is very complex in constitution. In some species the magnesium is replaced by lime. The characteristic property of minerals is that of cleavage, the splitting or dividing along definitely determined directions. Asbestos possesses this property in a very marked degree, and produces veritable fibres indefinitely divisible in thickness, but not in length. It thus has two properties of advantage for incorporation with cement, that of flexibility and resistance to tension. Asbestos cement is really reinforced concrete, with the asbestos fibre replacing the steel. Figure I shows a comparison of reinforced concrete (above) with asbestos cement (below). But in making reinforced concrete the steel rods must be surrounded by concrete to at least the thickness of an inch in order to cover the metal. Because of its flexibility and its fineness, the asbestos fibres need be covered only to the extent of a few tenths of an inch, and very thin layers of the finished product obtained.

Asbestos cement is manufactured as follows: The asbestos is first ground in special mills which separate the individual fibres without tearing them. The fibres are then mixed with cement and water in

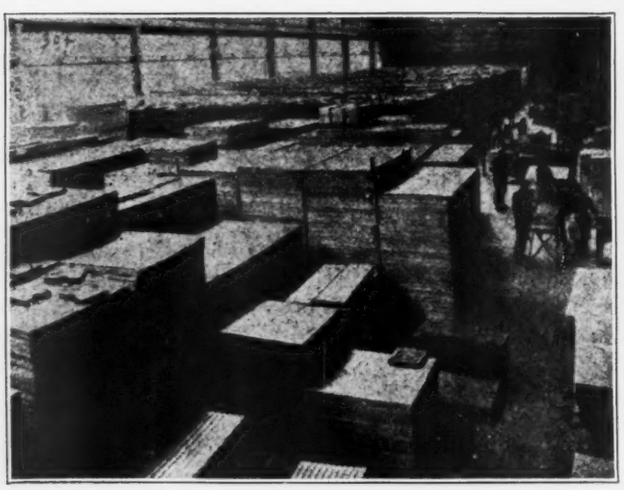


Figure II

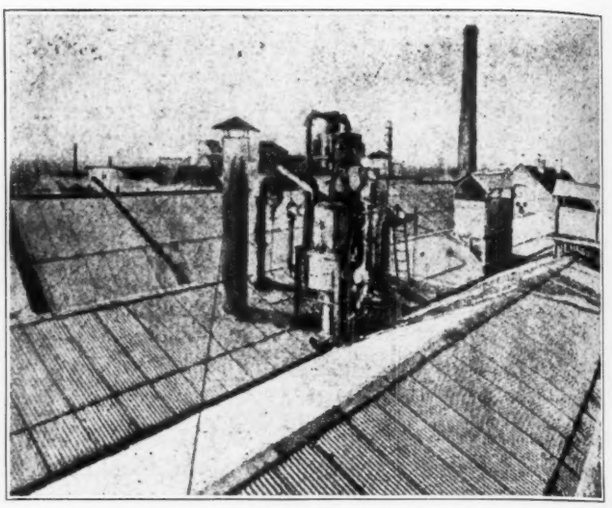


Figure III

machines called "hollanders" similar to those used in paper making. These form an intimate mixture and give a perfectly homogeneous paste. The paste is then rolled and dried in "pasteboard machines" to form sheets of the desired thickness, which are then compressed hydraulically. The sheets are then cut to standard size, and dried under conditions which complete the hardening of the cement. Figure II shows asbestos cement sheets hardening in the storage room under standard conditions for the hardening of cement. Asbestos cement is extremely resistant to chemical attack. Acids have little effect due to the formation of free silica which

Figure IV

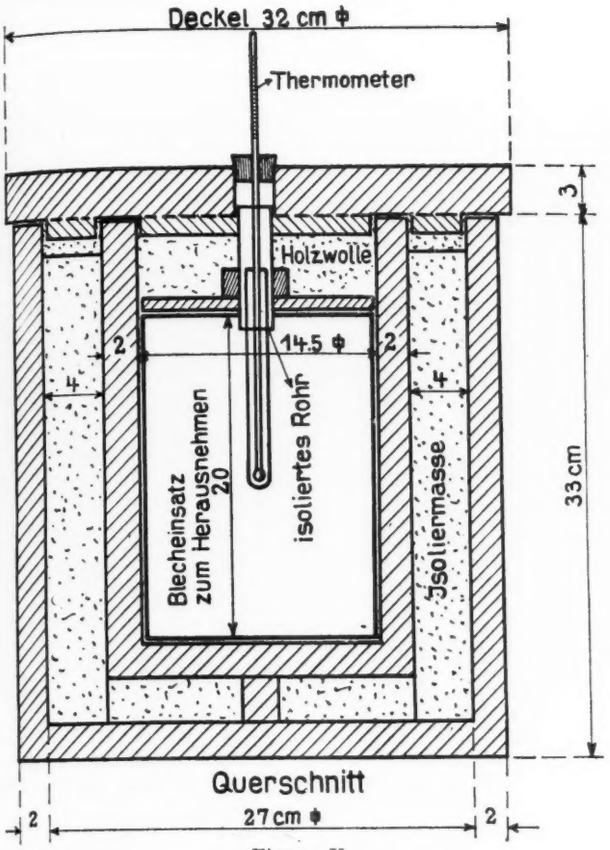


Figure V

protects the product from further action. Acid vapors have practically no action on asbestos cement due to the absence of electrolytic action. As shown in Figure III roofs made of this product are preferred by many chemical works. Alkalis and neutral salts have no action on asbestos cement. As this substance has no organic matter whatsoever, it is entirely immune to rot, or attack by microorganisms. The mechanical properties of asbestos cement make it very suitable for various purposes. Figure IV shows the resistance to bending of the corrugated variety. It is impermeable to water, has a very low thermal conductivity, and is a nonconductor of electricity. It is successfully used for interior and exterior walls, as a facing and in sheets as a ceiling or roof.—Quillard et Desnos (Le Ciment, Nov. 1928.)

Measurement of Heat Changes and Watertightness of Concrete

An apparatus for measuring the heat evolved during the setting of concrete was developed in the main laboratory of the Göschwitz (Germany) Cement Works and is shown in Figures V and VI. The mortar mix is charged into a central chamber of about three quart (3 liter) capacity and made of thin steel plate, surrounded by a wooden box which is set in a mass of non-conducting material. A thermometer tube passes to the center of the mortar mass and contains a thermometer, held by a stopper just above the bottom of the tube. After

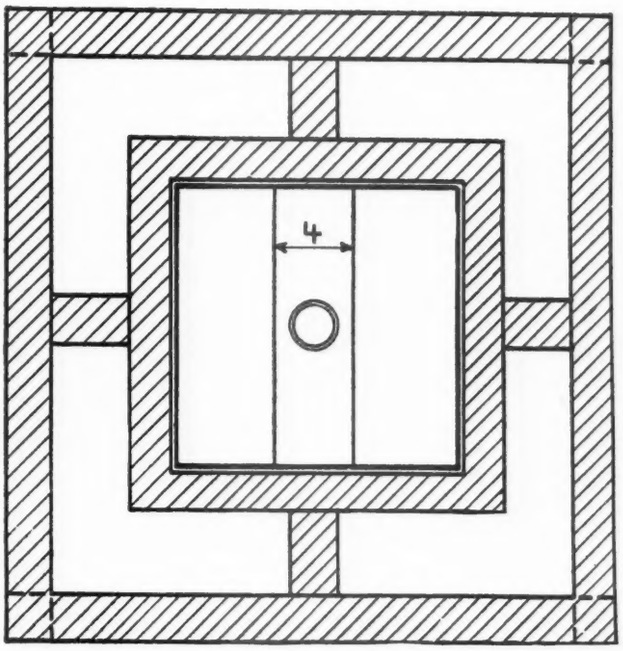


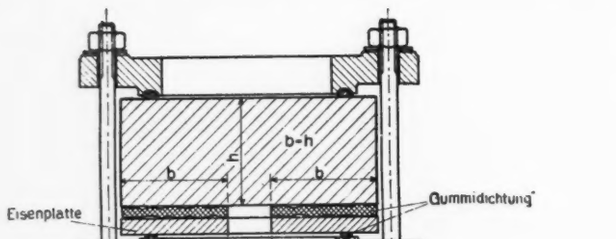
Figure VI

charging, the cover is put in place and saw dust or other insulator is packed around the thermometer well on top of the reaction box. The well is filled with alcohol or mercury, and the thermometer scale begins above the bulb a sufficient distance so that it is visible above the cover. The heat evolved is determined by half hourly readings of the thermometer so that a curve may be plotted.

The previous apparatus used for testing the watertightness of concrete was suitable for the testing of only thin sheets. An arrangement developed in the same laboratory, shown in Figure VII, will test concrete pieces of 10 inches square and $\frac{5}{8}$ inches thick. The water is introduced at the bottom under pressure into the center of the piece, as otherwise the tendency of the water to rise around the mass instead of through it would be pronounced. The iron tube set into the piece before pouring is threaded on the outside to assure a tight joint with the concrete. A rubber tube is passed through this iron one and into a small cavity in the center. The whole block is held in position with strong clamps screwed to iron plates. The pressure of water corresponding to that which just seeps through shows the permeability of the particular concrete to water.—Grimm-Göschwitz.

Paving Stone

Graded stone or similar material used in road making or foundations is mixed with dry powdered materials such as talc and MgO, which combine when heated to form Mg. orthosilicate. The mixture is formed into a paste with water, molded, and heated to a temperature below the melting point of magnesium orthosilicate, to obtain an artificial stone resistant to heat and to alkalis.—H. H. Holmes (British Patent 284,908).



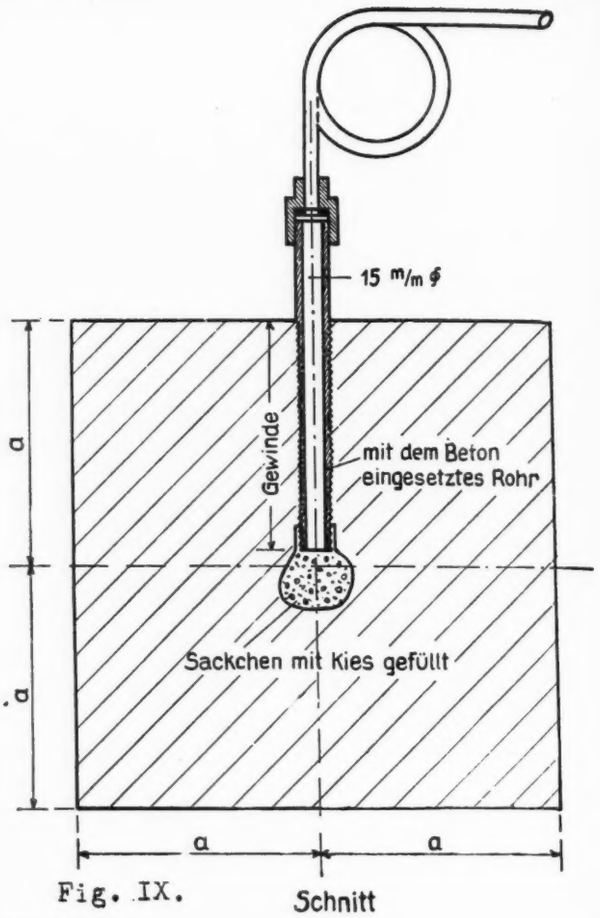


Fig. IX.

Figures VII, VIII and IX

Evolution of the Automatic Shaft Kiln

The original form of the rotating grate is used as a conical rotor. In the original form of the kiln no compressed air discharge was used, but the clinker simply dropped through the outlet tube. This was the form in 1914. A form of trap discharge was then substituted for the simpler forms of closure. At the same time the simple feeding devise was altered to the plate feed, and the revolving briquette press was changed to a three disk press. The supply of compressed air was then divided into two streams for each kiln, the upper pipe going to the upper part of the kiln and the lower one to the clinker discharge as shown in Figures VII and VIII. The "rolling grate kiln" was next devised and as its name implies, consisted of a grate laid upon four rollers, as in Figure IX. This grate did not revolve, but moved backward and forward with an erratic motion. The next improvement was a development of the hopper discharge, and the most recent form is the triple valve discharge.—Pollert (Zement, Nov. 15 & 22, 1928). (To be continued.)

Action of Gypsum on Cements

The action of $CaSO_4$ in solution and of sea water on Portland and aluminous cements is considered to be similar to the hydration of anhydrous compounds, as, for example, the slaking of lime. In the case of Portland cement, where the action takes place directly with the solid constituents of the cement, internal stresses are set up, due to expansion, which may be sufficient to disrupt the mortar or to disintegrate it more or less rapidly. If, on the other hand the reaction takes place only after the constituents have been dissolved in water, as is the case with aluminous cements, and the crystallization of the reaction products may even increase the strength of the mortar. Slag cements seem to contradict this theory, as they seem to fix CaO without previous solution of its constituents.—H. Lafuma (Chimie et Industrie, Spec. No. 431-3, 1928 & C. A.)

Contraction and Expansion of Concrete

Variations in length are caused by chemical changes during setting and hardening, variations in temperature and in humidity. The chief changes are due to the latter, being 0.036 per cent in an aluminous cement, 0.045 in a rapid hardening Portland, and 0.076 in a slag cement concrete. Age did not affect the intensity of the phenomena.—H. Rabozee. (Intern. Congress Testing Materials, II, 167-71 and C. A.)

INTIMATE NEWS OF MEN AND PLANTS

Structural Slate

The Structural Slate Company of Pen Argyl, Pennsylvania, has just issued an exceptionally interesting illustrated publication, its "Struco Slate Review." The publication is said to be in response to numerous requests concerning the diversified uses of slate. It is affirmed that slate needs no appraisal as the limited field in which it has been used for centuries has clearly established its claim to uniqueness, adaptability and superiority. The illustrations are concerned with actual uses of Struco Slate and the text not only treats its uses but points the way to other fields.

Indiana Merger Progressing

Work of auditing the books and records of twelve local stone companies in the Bedford, Bloomington, district of Indiana, entering the third merger, was completed December 8th.

It was said by one of the operators that conditions look good for the merger to be consummated by the first of the year.

When this deal is completed it will include practically every independent operator in Monroe County.

Texas Plant to Install Norblo System

Smith Brothers, Dallas, Texas, have awarded the contract for supplying and installing a complete dust-collecting system in their cement plant to the Northern Blower Company, Cleveland, Ohio.

New Feldspar Grinding Plant

Construction has been begun by Aberthaw Co., Boston, on new feldspar grinding plant for American Mineral Products Co., Inc., at Cold Village, town of Walpole, New Hampshire. Plant will include three connected units, about 60x230 feet.

New Plant Put into Service

The new million dollar plant erected in Charlestown, Massachusetts, on the Mystic River by the United States Gypsum Company, although not slated to begin operations until February 1st, was put into service when the first shipload of gypsum arrived. The British steamer Gypsum Prince in command of Captain Thomas O'Shea, came in from Windsor, N. S., with 5500 tons of crude gypsum, and her arrival marked the formal opening of the splendid new terminal, as well as the establishment of a new industry for the city and port which will furnish employment to hundreds of hands.

The crude gypsum will be stored as received, into the huge cement silos and taken as needed, for use in the manufacture of plaster, plasterboard and blocks for construction purposes.

New Material Company at Pine Bluff

Arkansas Sand and Material Company has incorporated at Pine Bluff, Arkansas. Marvin Jones and C. F. Krimm, incorporators. A large tract of land has been leased on the Arkansas River, warehouses and wharves are being built and spur tracks will be run in. Sand will be taken from the river.

Gypsum Companies Combined

The Atlantic Gypsum Products Company, 40 Central Avenue, Boston, has purchased the Pennsylvania Gypsum Company, Chester, Pennsylvania, and will continue its operations as a branch plant. The Pennsylvania company will carry out the expansion program recently announced, including new pier on the Delaware River. It has heretofore been under the control of the Canada Cement Company, Ltd., which has contracted with the Atlantic company for the entire supply of gypsum rock for cement mills in future. The last noted company is to operate such properties in Nova Scotia. Raw material will also come from this source for Chester mill.

California Plant to Install Dust Collecting System

The Blue Diamond Company, San Francisco, California, of which L. D. Gilbert is chief engineer, will soon install Norblo dust collecting units in the finish grinding and packing departments of their lime plant. The Northern Blower Company of Cleveland, Ohio, will install the equipment.

Harris Heads Gravel Co.

City Manager Fred R. Harris, of Jackson, Michigan, has resigned to become head of the Jonesville Gravel Company.

Bridgeton Sand Company Plans Reconstruction

Bridgeton Sand Company, Bridgeton, New Jersey, plans rebuilding power house and glass sand producing plant at Berlin, New Jersey, partly destroyed by fire November 21st. Adjoining glass sand plant of Pennsylvania Pulverizing Company was also damaged and will be rebuilt. Headquarters of latter company are at Lewistown, Pennsylvania.

What Can Be Done?

Above is a length of concrete pipe, for use in City work in Buffalo, New York, manufactured by the George C. Bartram Company with Lehigh Portland cement, furnished by the Great Lakes Portland Cement Corporation. It is 20 feet long, 8 feet 6 inches inside diameter and weighs 30.34 tons.

Quarry Changes

E. B. Taylor, manager of the Mid-West Stone Company at Greencastle, will manage the local quarry and Mr. Archie Duncan of Greencastle has come here to be assistant manager. Mr. Walter Patterson has been transferred to Greencastle and Bert Runyon is now superintendent of the local plant.

Quarry Manager Dies

John C. Collett, manager of the stone quarry at Ridgeville, Indiana, died at 3:45 A. M. Friday, December 14, 1928. The funeral was held at the Congregational Church Monday afternoon. Interment at Fountain Park Cemetery, Winchester, Indiana.

Chemical Company Plans Additions

Chemical & Pigments Company, Patapsco Avenue, St. Helena, Baltimore, has plans for three additions, including power house, pigment-mixing unit and storage and distributing plant, to cost over $85,000 with equipment.

Indiana Stone Areas Mapped

Indiana oolitic stone deposits have been completely mapped by Dr. W. N. Logan, state geologist, according to an announcement made today by the state conservation department.

The stone is among the most widely used building materials. Its area of production is in the Bedford district.

Two maps have been prepared by Dr. Logan, one comprising the stone area in Lawrence county and the northern portion of Washington, the other in Monroe and Owen counties.

New Corporations

Associated Sand & Gravel Co., % Geo. S. Russell, Attorney, 619 Land Title Bldg., Philadelphia, Pa., $25,000.

Western Hills Sand & Gravel Co., Cleves, Ohio. 250 shares n.p.v. Agnes Georgi, Frank J. Ulrich, Edward B. Ulrich.

Dixie Soapstone Products Corp., Arrington, Va. $200,000. Frederick J. Kandt, Pres., 25 Beaver St., New York City.

National Marl & Humus Co., R. D. 1, Berrien Springs, Mich. $5,000. Sidney A. Smith, Berrien Springs, Mich.

Los Angeles Portland Cement Co., C. A. Day, 2619 Wilshire Blvd., Los Angeles, Calif. $1,600,000; 30,000 shares n.p.v.

Columbus Sand & Gravel Co., Middletown, Ohio. $30,000.

Marble Crusher Co., 2006 Watson St., Detroit, Mich. $10,000. Marble chips.

New Michigan Stone Plant

The Inland Steel Company announces the organization of a new corporation for the production of chemical and metallurgical limestone to be known as the "Inland Lime and Stone Company."

The project will be located in the eastern end of the northern peninsula of Michigan 25 miles east of the city of Manistique.

As the result of an extensive exploration by diamond drilling conducted in the property held under options by the Manistique Lime and Stone Company, a large tonnage of high calcium limestone has been proven up.

In developing the project a large quarry will be opened—a railroad 25 miles long will be built to Lake Michigan and a large crushing and screening plant with harbor and docks will be constructed.

The Maritime Engineering Corporation, Major Rufus Putnam, president and Leatham D. Smith, vice president, is doing the designing and consulting engineering for the harbor, docks and loading equipment.

Stone will be produced not only for the steel industry, but also for chemical purposes, such as the paper industry, in which the Manistique Company has previously built up a substantial business.

The opening of the new quarry, the construction and operation of the new plant will be in charge of A. J. Cayia, formerly superintendent of the Wakefield mine, a M. A. Hanna property on the Gogebic Range in Michigan.

Metallurgical Limestone

Oliver Bowles. Blast Furnace, Oct., pp. 1308-12. Limestone, when used as flux in a blast furnace, is first calcined, then reacts with the impurities in the metal to form a slag. Precalcined lime reacts more readily, but does not justify the added cost of precalcination. The common impurities in limestone are about the same as in the ore. Since the flux must carry off its own impurities as well as those of the ore, it must be as pure as possible. The ratio of Mg to Ca in the limestone may vary widely; its importance is still a moot question, the high Ca and the dolomitic limestones both having their advocates. The size of stone should be fairly uniform and not too fine (retarding the draft) nor too coarse (very large lumps do not calcine completely). Rate of assimilation is an important factor which has not yet received sufficient attention.

Foreign Cement Affects Seaboard Prices

Reduction of cement prices amounting to ten cents per barrel went into effect December 10th on the southern seaboard market.

Dwight Morgan, vice president, Virginia Portland Cement Corporation, in a statement said "This reduction is made necessary in order to protect our markets and assist our dealers against the intense competition created by the displacement of domestic cement at seaboard markets through the importation of foreign cement."

Foreign cement is manufactured at wage scales far below those prevailing in this country and transported at exceedingly low ocean rates, enabling the foreign cement to reach our market at prices less than the American manufacturers can afford to meet.

Portland cement is on the free list, placing domestic cement in direct competition with the low cost imported product. This depression price on the Atlantic and Gulf seaboard again in turn affects the interior market, and domestic cement which would have been marketed on the seaboard must seek a market in the interior, which creates an oversupply in the interior, resulting in intensive competition and affecting, unfavorably, prices over a large area.

This competition has caused a curtailment of operations at the Norfolk mill during the past twelve months.

Operating Ratio

The ratio of the operations to the capacity of the American portland cement industry during the month of November was 77.4 per cent, according to figures recently released by the Bureau of Mines of the Department of Commerce. During the month 15,068,000 barrels were produced, 11,951,000 barrels were shipped, and there were in stocks on hand at the end of the month 17,696,000 barrels. Production in November, 1928 was 4.3 per cent more, and shipments 2.9 per cent more than in November, 1927. Stocks at the mills were 10.4 per cent higher than a year ago.

Lime from Oyster Shells

Plans are being arranged for new one-story mill, 45x350 feet, at Houston, Texas, for production of lime products, using oyster shells as raw material, to cost over $130,000 with machinery. W. A. Brunet, Houston, is construction engineer in charge.

Recent Patents

The following patents of interest to readers of this journal recently were issued from the United States Patent Office. Copies thereof may be obtained from R. E. Burnham, patent and trade-mark attorney, Continental Trust Building, Washington, D. C., at the rate of 20c each. State number of patent and name of inventor when ordering.

1,691,062. Steering-gear. Arthur G. Hendricks and Holger L. Mitchell, Milwaukee, Wis., assignors to Harnischfeger Corporation, same place.

1,691,100. Dragline arrangement. Emery J. Wilson, Cleveland, Ohio, assignor to Thew Shovel Co., Lorain, Ohio.

1,691,210. Grinding and pulverizing mill. Bernhard Scherbaum, Wedel, Germany.

1,691,553. Crusher. Harvey H. Rumpel, Milwaukee, Wis., assignor to Smith Engineering Works, same place.

1,691,951. Pulverizer. Theodore C. Alfred, Lancaster, Ohio.

1,692,161. Crusher. John A. Dormer and James G. Malone, Detroit, Mich.

1,692,195. Bucket. Herbert S. Atkinson, East Orange, N. J., assignor to Hayward Co., New York, N. Y.

1,692,501. Dipper-tooth. George R. Hanks, High Bridge, N. J., assignor to Taylor-Wharton Iron & Steel Co., same place.

1,692,823. Apparatus for handling loose material. Sidney W. Farnham, Chicago, Ill., assignor to Goodman Mfg. Co., same place.

1,692,872. Power shovel. William W. Sloane, Chicago, Ill., assignor to Goodman Mfg. Co., same place.

1,692,884. Crushing, grinding and refining machine. Swinfen Bramley-Moore, White Plains, N. Y.

1,692,903. Grinding, refining, and mixing machine. Swinfen Bramley-Moore, White Plains, N. Y.

1,692,974. Balanced ball mill. William M. Barker, Canton, Ohio.

1,693,001. Gravel-washer. Charles F. Smith, Milwaukee, Wis., assignor to Smith Engineering Works, same place.

1,693,041. Belt-fastener for conveyers. Edmund C. Morgan, New York, N. Y.

1,693,247. Ring mill. Joseph Molz, Oberhausen, Germany, assignor to Babcock & Wilcox Co., Bayonne, N. J.

1,693,344. Loading and conveying apparatus. Edmund C. Morgan, New York, N. Y.

1,693,644. Wet process for manufacture of cement. Werner P. Eckdahl, Chicago, Ill.

1,693,688. Mixing-machine (for concrete, etc.). Lionel J. B. Blake, Bishops Stafford, England.

1,693,809. Power shovel or excavator. Bird C. Clutter, Akron, Ohio, assignor to Clutter-Wagner, Inc.

1,693,954. Tunneling-machine. Howard E. Marsh, Lompoc, Cal.

1,694,255. Sand washer and separator. Edward Garlick, Kelso, Wash.

1,694,355. Machine for preparation of molders' sand. George F. Royer, Wilkes-Barre, Pa., assignor to Royer Foundry & Machine Co., same place.

1,694,356. Sand collecting and treating machine. George F. Royer, Wilkes-Barre, Pa., assignor to Royer Foundry & Machine Co., same place.

1,694,372. Boom track for bucket concrete distributors. James E. Bushnell, North Plainfield, N. J., assignor to Ransome Concrete Machinery Co., Plainfield, N. J.

1,694,423. Crushing-machine. William K. Liggett, Columbus, Ohio, assignor to Jeffrey Mfg. Co., same place.

1,694,498. Rotary screen or plate for producing it. William C. Bruton, Berkeley, Cal., assignor to American Manganese Steel Co., Chicago, Ill.

1,694,565. Vibratory screen. Lewis E. Soldan and George W. Behnke, Gladwin, Mich., assignors to Simplicity Engineering Co., Durand, Mich.

1,694,588. Method of curing concrete. Dozier Finley, Berkeley, and William L. Rhoades, San Francisco, Cal., assignors to Parrafine Companies, Inc., San Francisco.

Florida Plant Enlarges

The Fullers Earth Company, Midway, Florida, has completed plans for a new mill which is to be built in the near future. Another new mill which had been under construction for five months was recently put into operation increasing the output of the company about 25 per cent. A. E. Bagnall is plant manager.

Utah Plant Completed

The Utah Rock Asphalt Corporation has erected a mill at Sunnyside, Utah, at a cost of $182,000. A five mile tramway from the deposit to the mill is under construction. Additional grinding units will be installed to increase production of 1500 tons per day. C. N. Power of Chicago is president of the company. The principal office is at Pueblo, Colorado.

Ward Appoints J. A. Beuchler

The Ward Sand and Gravel Company of Oxford, Michigan, recently appointed J. A. Beuchler of Oxford as general superintendent.

New Pennsylvania Plant In Operation

The Keystone Sand and Supply Company of Pittsburgh, Pennsylvania, recently placed in operation a new plant on the west bank of the Monongahela river at South Third Street. A three yard whirley removes the material from barges and places it in storage bins with a capacity of 25,000 tons. A belt conveyor 200 feet long moves the material across the tracks of the Pittsburgh and Lake Erie railroad to delivery bins with a capacity of 2,000 tons which can load twenty trucks at one time.

Indiana Gravel Plant To Expand

The Neal Gravel Company of Covington, Indiana, plans to build a new gravel plant just west of that city to be in operation by spring. Concrete foundations are now being poured and construction will go on during the winter. The new plant will double the capacity of the company's operations. Ed Francis is superintendent.

South Dakota Quarry Plans Plant Expansion

The Black Hills Marble Quarries Corporation of Rapid City, South Dakota, plans the erection of a lime kiln with a daily capacity of 100 tons and of a brick and tile factory, according to a recent announcement by George C. Lauer, secretary of the company. The projects, which will be completed next spring, will involve an expenditure of over $100,000.

Elmer Ambrose Sperry Heads Mechanical Engineers

The election of Elmer Ambrose Sperry of New York City, developer of the gyro-compass, as president of the American Society of Mechanical Engineers was announced recently. He was prominent in the development of the gyroscope as a compass and for the stabilization of ships and airplanes and in the electrical field both as an inventor and manufacturer.

Stone Company Changes Name

The Buff and Blue Oolitic Stone Company has filed in the office of the clerk of the Monroe Circuit Court its petition for the change of its name to the Victor Bluff Stone Company. The petition will be heard February 11, 1929.

NEWS OF EQUIPMENT MANUFACTURERS

Butler at the Road Show

The Butler Bin Company, Waukesha, Wisc., has been awarded space AA-18 in the Main Arena. Its exhibit will constitute a 40 cubic yard two compartment bin equipped with a set of the latest type Butler weighing hoppers featuring the Butler all steel scale. In conjunction with this exhibit a contractors elevator will be shown, by means of which material will be delivered to the bin and drawn off into the weighing hoppers, where this weighing operation will be shown. The installation will be in continuous operation and should prove very interesting. Measuring hoppers and different types of bin gates will also be shown. New bulletins and literature will be ready for distribution and moving pictures will be employed to illustrate the methods of erecting and dismantling. The exhibit will be in charge of M. R. Butler, A. R. Morton, C. E. Riblet and M. A. Kelley.

Barber-Greene Exhibits

The new Barber-Greene excavator, an entirely new machine will be the center of attraction at the Barber-Greene booth WW 25 and 35. This new excavator which many of the attenders of the Road Show are looking forward to seeing, embodies many features and principals never before seen on a machine of this kind.

The Barber-Greene Company will also display another new machine, the B-G belt car unloader. This is a small thin conveyor for taking sand and gravel out of railroad cars and feeding it to another machine.

As usual, those who come to the Barber-Greene booth will see the B-G vertical boom ditcher—making its fifth appearance at the Road Show—and showing many new improvements. There will also be the latest B-G bucket loader—and conveyor. There will be continuous movies showing the various B-G machines in operation in all parts of the county.

Bay City to Exhibit

The Bay City Dredge Works will exhibit three separate and distinct machines this year in the Central Armory Building, space AY-9. Model R ¾ yard full circle heavy duty full revolving machine was designed and announced this summer. It is a 25 ton full crawler mounted, full revolving convertible excavator featured with shovel, clamshell, drag line, skimmer or trench hoe buckets. It is equipped with climax 65 h.p. engine with electric self starter and has a number of features not found on its other full revolving equipment, including a 6 foot diameter swing circle which eliminates rocking and tipping on the center pin. The base of the boom is located on 30 inches from the center pin, giving it unusual stability.

The Bay City Tractor Shovel, two models of which were displayed last year, will again be exhibited at Cleveland with shovel, boom and bucket. This is a fast moving and operating full crawler convertible shovel operating clamshell, drag line and trench hoe in addition. It is powered by the McCormick Deering industrial tractor and mounted with long full crawlers. It travels at speeds up to four miles an hour under its own power.

The third Bay City machine will not be mentioned by name or illustrated prior to its display at the Road Show. This machine is intended as a surprise to the contracting public and no further information is available at this time other than it will be a small, fast, full revolving machine with six different bucket attachments, full crawler mounting with buckets of ⅜ to ½ yard capacity. The machine will weigh approximately 13 tons. Car body and machinery base are of high manganese unit steel castings. Many special features including a patented propelling and steering mechanism eliminating all square jaw clutches and machinery below the car body are embodied.

Trailer Bulletin Issued

The Smith Trailer Corporation of Syracuse, New York, is distributing an illustrated 4 page Bulletin 103, which describes its bottom dumping trailers. These are tractor drawn and of all steel construction. All trailers are equipped with a heavy duty spring draw bar which requires no extra attachment for extra haulage. Trailers are equipped for hauling in train and furnished with standard connections.

General Electric Dividends

The regular dividends of the General Electric Company were declared at a meeting of the Board of Directors of the company on December 7, 1928, amounting to $1 per share on the common stock and 15 cents per share on the special stock, payable January 25, 1929, to stockholders of record as of December 19, 1928. In addition an extra dividend of $1 per share, payable on the same date, was declared on the common stock from the surplus of the company accumulated from the financing of time installment sales, which surplus had been set aside as a reserve as stated in the 1926 annual report and which amounted to upward of 5 millions of dollars, and from the increase during the present year in income from investment and sources other than regular sales.

Speed Reducer Bulletin

The Falk Corporation, Milwaukee, announces a new Bulletin No. 190 on Falk Herringbone Speed Reducers. This bulletin contains much information not included in the issue it supersedes. It lists 18 new sizes of reducers—standardized uniform ratios—simplified rating tables—besides the new complete line of welded steel motor beds. In addition to the three types of herringbone gears which are described in the bulletin, there is an entirely new section composed of pictures of installations of Falk units in various classes of industry.

National Flue Appoints Western Representative

The following western representatives have been recently appointed by the National Flue Cleaner Company, Inc., of Groveville, New Jersey, to handle the National Soot Blower for fire tube boilers: McGee Sales Agency, 75 Fremont St., San Francisco, California; Flickinger, Meyers and Rudolph, 129 W. Second St., Los Angeles, California, and Manufacturers Sales-Service, Salt Lake City, Utah. W. A. Ramsay, Ltd., Honolulu, was appointed representative for Hawaii.

Oil Engines For Power Plants

The Anderson Engine and Foundry Company of Anderson, Indiana, is distributing its Bulletin No. 32K, 1929 edition, which describes dependable, economical stationary power plants from 30 to 325 horse power. It claims to have incorporated all the proven points of successful oil engine manufacture and that these engines can furnish power where economical and dependable power is needed. They are guaranteed not to vary over 4 per cent, from no load to full load, and to successfully synchronize with other properly governed prime movers.

Morris Machine Moves Detroit Offices

The Morris Machine Works of Baldwinsville, New York, builders of Morris centrifugal pumps, announces the removal of the Detroit office to 730 Fisher Building.

Cincinnati Company Enters Industrial Locmotive Field

The Cincinnati Car Corporation, Winton Place, Cincinnati, Ohio, offers the industrial haulage and switching public the benefit of 30 years' experience, together with its engineering and manufacturing facilities, in the marketing of a complete line of industrial locomotives in gasoline, gasoline electric, Diesel, electric trolley and storage battery types, known as the Cincinnati line. These locomotives will be furnished in a variety of sizes from two and three ton units up to fifty ton, or larger, and in various track gauges, affording equipment suitable for handling either small or large industrial cars in all kinds of service, as well as for switching.

The company has been building electric trolley type locomotives of various sizes and many of the proven features of design in this type are incorporated into the additional types, particularly the gas electric. Different features of design otherwise are based on the experience of a part of its present organization extending over 15 years in the gasoline locomotive field, and involve the most up-to-date mechanical and construction ideas and principles. Ruggedness, ample power, simplicity and accessibility are the prime features sought throughout all of the different types and models.

The Cincinnati Car Corporation has large shops and facilities for the manufacture of these locomotives. It has a capable engineering department that will always be at the service of its customers and prospective ones in connection with their haulage problems. H. R. Sykes, who is one of the pioneers in the development, manufacture and sale of industrial locomotives, and who is well known to many of the locomotive using public, will be in charge of sales and service of the locomotive division. Two of its popular size gasoline-powered locomotives will be exhibited at the coming show of the American Road Builders' Association at Cleveland in January, where the Company will be pleased to meet its old friends as well as new ones.

A New Clamshell Bucket

A clamshell designed for greater digging power has been announced by the Lakewood Engineering Company, Cleveland, Ohio, for use in all kinds of digging and excavating work, including deep water dredging, handling quarried rock and work in slag dumps as well as rehandling.

The open reach of the jaws averages 25 per cent more than the majority of the clamshells on the market today, which results in a directly proportionate increase in yardage of material handled for the same bucket weight. Another feature is the concentration of closing power near the end of the stroke so that the shells are forced to stay down in the material until they are fully closed.

The head of the bucket is one piece of cast steel. It has wedge sockets for dead-ending both cables. The closing leaves the head on the center line, thus insuring the bucket's carrying level and digging evenly. A guide sheave and three hardened rollers insure a fair lead of cable, while reaving is straight with no "S" bends.

All moving parts are brushed with heat treated, glass hard alloy steel pins working in the bushings are of chrome nickel heat treated steel but are several points softer than the bushings so that wear will be confined to the pins, which may be replaced without dismantling the bucket or removing it from service.

The power arm sheaves are mounted on double row ball bearings thoroughly enclosed and protected by watertight seals. The shells are constructed of steel plate and have cast steel hinges. The cutting edges are .50 carbon steel with hardened edges.

Each bucket is drilled for the standard set of seven teeth. These are of alloy steel with hardened chisel points and are held in place by common machine bolts. The capacity of the buckets ranges from ½ to 2 yards and the weight from 2,350 to 5,800 lbs. Buckets can be equipped with spreader bars of sheave for double holding line. Sable reaving can be varied from 2 to 5 parts as work requires.

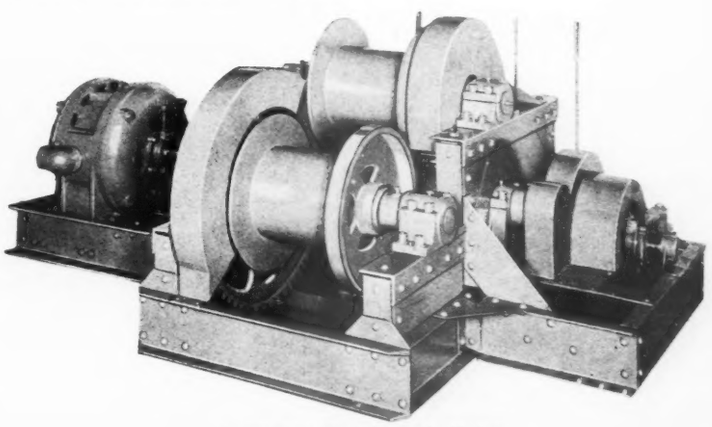
Construction Machinery Will Market Kern Hoists

The highly specialized Kern Variable Speed Hoist, has just been placed on the market in various sizes by the Construction Machinery Company of Waterloo, Iowa. This hoist was developed by Fred T. Kern of Milwaukee, Wisconsin, whose intimate knowledge of the pit and quarry field enabled him to design a hoist demanded by this field to withstand the terrific strains without interruption to service.

Five years ago the first Kern hoist was built and met with unprecedented success. The two factors of successful pit and quarry operation—freedom from interruptions and low cost of operation have been carefully considered in designing this hoist, and are brought about through the incorporation of many unique features.

A few of the advantages and features of this hoist as given us by the Construction Machinery Company are: Two speeds on both inhaul and retrieve drum — without working through the operating clutches giving better application of power and higher efficiency; stationary drum shafts guaranteed for the life of the hoist; four identical high speed clutches working on special countershaft eliminate the chronic clutch trouble which is prevalent in the general run of hoist equipment; and minimum of power and wide range of adaptability.

These hoists are now being produced in one-half yard capacity, one yard capacity, one and one-half yard capacity, and two yard capacity. A new bulletin will soon be off the press for distribution and we suggest that our readers write the Construction Machinery Company at Waterloo, Iowa, requesting a copy of this bulletin for their reference. The Kern Hoist was taken over by the above mentioned firm as a part of its expansion program.



A Highly Specialized Hoist

Equipment Corporation Formed to Make Special Screens

During the closing months of 1928 the Productive Equipment Corporation of Chicago has been formed to manufacture and distribute a new type of vibrating screen. The design involves a positive eccentric action duplicating screen actions embodied in older constructions made by L. E. Soldan, president of the company. The new screen, in addition, incorporates in its design a variable eccentricity adjustable from a neutral setting where the eccentricity is zero to a maximum setting where the eccentric throw is ⅝ inches. This is accomplished through the use of an eccentric sleeve on an eccentric shaft. By changing the position of the sleeve eccentricity with respect to the shaft eccentricity, a change in the accumulative eccentricity takes place.

An easy method for changing the tilt, or inclination, of the screen is employed. This is part of the standard design for the purpose of having a positive, quick means of adjusting the screen to take variations in tonnage, or to handle material whose screening characteristics change from day to day. The construction involved is accomplished through mounting the vibrating mechanism in a circular cradle and using hand star wheels to keep the screen assembly rigid in the cradle shell at any degree of inclination. This is adjustable from O degrees to 50 degrees from the horizontal.

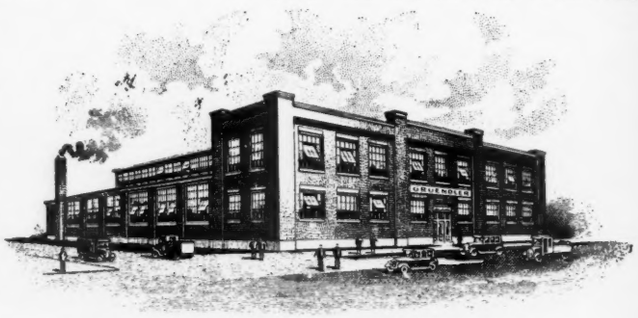
A rapid screen cloth changing and holding device is used in the Jigger. Ordinary cloth of any mesh opening or wire diameter is inserted between angle iron brackets located next to the screen side sheets. By turning hand star wheels, the cloth is gripped securely between these angle irons and by continued turning of the hand star wheels proper tension is obtained in the cloth. No preparation of the screen cloth is necessary except to bend the edges back at right angles.

Through the use of variable speed motors or step come pulleys a variation in speed of this screen can be obtained to meet any change in screening conditions.

Gruendler's New Home

The Gruendler Patent Crusher and Pulverizer Company completed its new home December 1st and since December 10th the entire organization has been happily housed within its walls. The new plant has everything that thought, skill and money can provide to promote the efficient manufacture of crushing, pulverizing, grinding, screening and conveying machinery and equipment, including immense cranes, carriers and lifting devices, powerful cutting and welding machines, lathes, punches, drills and other contrivances for special purposes that make it one of the most complete specialty industrial plants in the Middle West.

Established in 1885, the Gruendler Company has grown and prospered continuously for nearly half a century, first under the careful management of the late Wm. Gruendler and, since his death in 1909, under the supervision of his son Wm. Paul Gruendler, aided by Harry J. Shelton and Jos. W. Mattman.



The New Gruendler Home.

Many concerns, in all parts of the world, have profited by the advice and assistance of these men and their organization of engineers and experts. The Gruendler name is nationally advertised and has long since gained a reputation for honest dependability and sincere service. Gruendler crushing and grinding installations do their work well and last at least a lifetime. This big, new, up to date factory is the direct result of outstanding quality and understanding helpfulness, rendered through the years gone by and which will undoubtedly continue to create good will and a constantly increasing demand for Gruendler products wherever there is need for crushing, grinding or pulverizing. A corner of the new plant has been set apart as a laboratory or experimental room, where special problems are studied and usually solved. This service is free to all who are confronted with a difficult grinding proposition.

The Heil Company to Exhibit

The Heil Company will exhibit its new Heil No. 1 junior hoist for the first time at the Cleveland Road Show. This hoist and the Heil hydraulic hi-lift hoist, which will also be on exhibit, completes the Heil line of hoist equipment for dump trucks. The firm now has a hoist and dump body for every make, model and capacity of truck from one ton up.

A dump body equipped with swinging partitions that have cement compartments attached will also be on display. Provision has been made so that there is one compartment for each batch. The cement, loaded at the same time as the other aggregates at the central station, is mixed with the aggregates at the mixer, thus eliminating all handling of materials by hand. This new method of handling concrete effects great savings in time and money. It eliminates the necessity of two to four men at the mixer and the blocking of sidewalks near the mixer with large piles of concrete. The cement, while in the dump body, is under cover so that rain will not affect it. Steel dump bodies, mechanical hoists, and the Gettelman hi-speed snow plow will also be exhibited in the West Wing at Booth 71 which the Heil Company will occupy.

The Company believes 1929 will be a banner year in the construction industry and it has made adequate preparations for a large volume of business. A $60,000 addition has been made to the hoist machine shop at the main factory in Milwaukee. The factory branches at Chicago, Boston and New York have moved into new and larger quarters. A new branch factory has been opened in Baltimore. Ten more distributors have also been added and the firm now has a nation wide sales and distributing organization.

Hydraulic to Exhibit

The Hydraulic Hoist Manufacturing Company of St. Paul will exhibit in Space WW55, West Wing of Auditorium. V. L. Farnsworth, sales manager, and Fred Bell will be in charge. Working models of various types and sizes of St. Paul hoists will be on display, together with various installations of interest.

Botfield Appoints Distributor

Botfield Refractories Company, Philadelphia, Pennsylvania, manufacturers of Adamant fire brick cement; Adamant-Adachrome super-refractory mixtures and The Adamant gun, announces that McCarthy-Jones and Allen Company, Inc., 111 First Avenue, South, Nashville, Tennessee, has been appointed a distributor.

Lower Cost Crushing By Synchronous Motors

The highly desirable characteristics of the synchronous motor for constant speed drives over other types of motor equipment has led to their increasing use on primary crushers of all kinds. Specialized design and the perfection of automatic control have enabled them to perform with a high degree of success. On such severe drives as hammermill crushers, where starting requirements and peak loads impose an exceptionally heavy duty, synchronous motors are now being applied and are operating very satisfactorily.

The advantages of the synchronous motor, outlined as below, are of foremost importance to the user of crushers, because they reduce the cost of power for crushing.

Operates at Constant Speed

Absolutely constant speed is an advantage on any type of primary crusher and especially on gyratory and cone crushers which operate "against time." The desirability of constant speed makes it important that the driving motor be selected to fulfill this requirement. The synchronous motor has no "slip," and the speed of rotation is constant regardless of variation in load or variation in voltage. The synchronous motor rotates in "synchronism" or in "step" with the frequency of the a.c. power system.

Constant speed makes for constant flow of material through the crusher, giving greater capacity and greater uniformity of the crushed product.

Operates at High Power Factor

Synchronous motors always operate at unity power factor, which is the most efficient power factor for the operation of an electrical power system, or at leading power factor to compensate the lagging power of induction motors.

Low power factor resulting from the use of low speed and partly loaded induction motors is an undesirable and uneconomical condition. Many power companies penalize for low power factor and where power is privately generated, low power factor increases the cost of generating power. Maintenance of high power factor by the use of synchronous motors insures minimum power cost.

Has High Power Conversion Efficiency

In the conversion of electrical to mechanical power the synchronous motor operates at a considerably higher efficiency than the induction motor. At speeds of 450 to 514 r.p.m., for instance, the full load efficiency of the synchronous motor is approximately 3 per cent higher than that of an induction motor. In addition, at part loads, the synchronous motor efficiency drops off very slowly so that it is high over the entire range of operation.

Higher efficiency results in material savings in power cost. Thus a 200 h.p., 450 r.p.m., synchronous motor will have approximately 5 kilowatts less loss than an induction motor of the same rating. With power at 2c per kilowatt-hour and 10 hours daily operation 300 days per year, the annual power saving amounts to $300.00.

Figure 2

Figure 1

Where the cost of power is high and where the motor is in operation a large part of the time, as in crusher applications, the savings in power cost can easily equal, during the life of the machine, the original investment in the motor.

Can Be Directly Coupled to the Load

Synchronous motors because of their inherent design characteristics operate very efficiently, and are economical in first cost at low speeds. Induction motors, however, are handicapped in performance below speeds of 600 r.p.m., so that high speed induction motors with speed reducing devices are usually resorted to.

Direct coupling to the crusher is usually easily accomplished with the synchronous motor with a large saving over belt, chain, or gear drives, both in floor space, in power cost, in maintenance, and in the elimination of possible shutdowns due to defects in the speed reducing mechanism.

Is of Simple Rugged Construction

The construction of the synchronous motor is simple and rugged assuring long life with freedom from maintenance expense. They can be installed anywhere in the plant.

The synchronous motor has an air gap much larger than that of the induction motor making far less bearing maintenance expense. In dusty, gritty air conditions in which crusher motors usually operate this becomes an important consideration.

Recent developments on the synchronous motor have had mostly to do with improving its starting char-

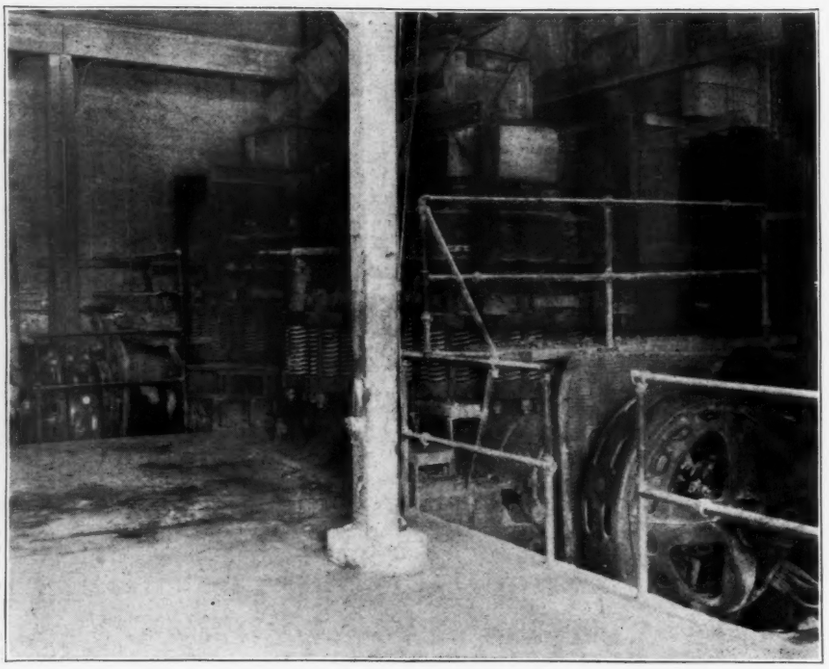


Figure 3

acteristics and in the perfection of automatic control.

Synchronous motors are now obtainable which have starting characteristics equal to or better than squirrel-cage induction motors. The use of double squirrel-cage windings where torque requirements are severe gives a high starting and pull-in torque with a moderate current inrush from the line.

Automatic starting with the frequency relay control reduces the starting operation to pushing a button and enables trouble free operation with unskilled attendance. The motor is fully protected against all abnormal power or load conditions, minimizing interruptions to production.

Typical installations on primary crushers made with Electric Machinery Company synchronous motors are shown in figures 1, 2 and 3. Figure 1 shows the latest development in automatic starters.

The synchronous motor shown in Figure 1 is direct connected to a Kennedy-Van Saun Gyratory Crusher. The usual construction of the motor is reversed, the stator being on the inside and bolted to the frame of the crusher. The rotor is, in effect, the usual pulley wheel supplied with this type of crusher, within which are mounted the field poles. A very compact, highly efficient installation results, which can be belted to an engine, if a source of electrical power is lacking, and then operated electrically at any time electrical power becomes available.

The synchronous motor installation shown in Figure 2 at the plant of the Diamond Portland Cement Company is an example of successful application to a severe drive. The motor is connected to a Jeffery hammermill for crushing the quarry runs of limestone.

Heavy weight and large inertia of the hammermill rotor makes necessary high starting, accelerating and pull-in torques. The most difficult conditions to be met, however, are the very high peak loads encountered during normal operation.

Because there are usually more low points in the load curve the power factor of an induction motor driving such a load would be low. Low power factor has been accepted, however, because it was felt that a synchronous motor which, of course, would not "slip" when the peak loads were encountered, would fall out of step and thus fail. By taking full advantage of synchronous motor design factors that influence starting, pull-in, and pull-out torques, a success was made of the first synchronous motor applied to this type crusher. Subsequently, additional applications of this type have been made. The frequency relay actuated automatic starter used with this motor permits the motor to resynchronize when unusually peak loads pull it momentarily out of step.

Symons Cone Crushers are being successfully driven by synchronous motors as shown in Figure 3, an installation at the St. Louis Smelting & Refining Works of the National Lead Company, at St. Francois, Missouri. The design of this crusher and its operation "against time" makes absolutely constant a distinct advantage. Output and uniformity of product are both improved by constant speed operation with synchronous motors. Synchronous motors are also successfully applied to roll crushers and jaw crushers.

Deister Machine Improves Plat-O Vibrating Screen

Since the Deister Machine Company is satisfied that high screening efficiency and correspondingly large capacities can only be obtained on a flat screening angle, it has paid particular attention to improvements in the construction of its Plat-O Screen. It offers a screen of large gross capacity, with a screen cloth of long life, absence of vibration and consequent noiselessness. The horizontal, or differential, conveying section of this screen permits it to be installed at an angle of from 10 to 15 degrees.

Due to the improvements in the construction of the vibrating mechanism, this screen is practically noiseless, as the large chrome vanadium coiled steel vibration absorbers take up practically all vibrations and prevent them from being carried into the building structure. It has also been demonstrated in actual operation that more than seven months of continuous heavy service with the original screen cloth is not unusual. In construction it is said to have no equal and is a leader among the vibrating screens now being used in the pit and quarry industries. The management and engineers of the company, with more than 20 years' experience in the manufacture of coal and ore treating machinery, are satisfied with this, their latest contribution to the mining and quarrying industries.

Improved Vibrating Screen

The Lewistown Foundry and Machine Company has contributed a new vibrating screen, during the year 1928. It was primarily designed to meet the demand of glass makers for a uniform and finely screened sand. This screen is said to have exceeded all expectations of the manufacturers in the quantity of sand produced and exceeded in production all screens investigated by it.

The vibration of the screen is accomplished mechanically by alternating current and can be installed in any plant where electric power is available without the use of generators or transformers.

Weigel Is Elected to Vice Presidency

H. D. Savage, president of Combustion Corporation of America, announces the election of Carl F. Weigel as vice president and general manager of the subsidiary company, Hedges - Walsh - Weidner Company, Chattanooga, Tennessee. Prior to the combination of the Walsh and Weidner Boiler Company and the Casey-Hedges Company, which occurred the early part of this year, Mr. Weigel was chief engineer of the Walsh and Weidner Boiler Company, which position he had occupied for many years. From the date of the combination of these two companies up to the present, Mr. Weigel has served as chief engineer of the combined organization.

A New Shovel-Crane-Dragline Added to Link-Belt Line

Link-Belt Company announces adding to its line a heavy duty ¾ cubic yard size of crawler-shovel-crane-dragline, known as Type K-25.

With the addition of this and the heavy duty 2 cubic yard size announced last summer, Link-Belt now offers a complete range of sizes for selection, any or all of which can be shipped loaded on flat cars without dismantling.

The new heavy duty ¾ yard size is rugged and fast, is liberally powered, with gasoline engine, Diesel engine, or electric motor drive, as desired, and is easy to operate. As a shovel, it is equipped with ¾ yard struck measure capacity dipper. As a dragline or crane, it will handle a ¾ cubic yard bucket on a 40 foot boom.

Typical Link-Felt features incorporated are: One piece annealed cast steel lower frame; one piece annealed cast steel rotating base; self cleaning chrome steel crawler threads; large bronze bushed crawler rollers; totally enclosed lower frame travel gears, running in oil; full steel house enclosing operator and the machinery; unusual accessibility, and comfort for operator; and quick and easy convertibility from shovel to crane, dragline, trench hoe, etc., or vice versa, without changing or disturbing the mechanism of the machine proper.

At the Road Show, to be held at the Cleveland Auditorium, Cleveland, Ohio, the Link-Belt space will be W. W. 9.

The principal Link-Belt exhibits will be: A Type K-25 ¾ yard heavy duty shovel; a Type K-55 2 yard heavy duty shovel; and a new Link-Belt grizzly crawler loader. These will be supplemented by photographs of Link-Belt machines taken on the job.

As Low Cost Insurance Industry Adopts Oxwelding

Many manufacturing and industrial plants located in isolated spots have long ago come to the realization that it pays to employ a competent welder about the plant. In the past, when a machine or a part broke, there was added to replacement cost the additional expense of lengthy shut downs while the new parts were being shipped from distant supplies.

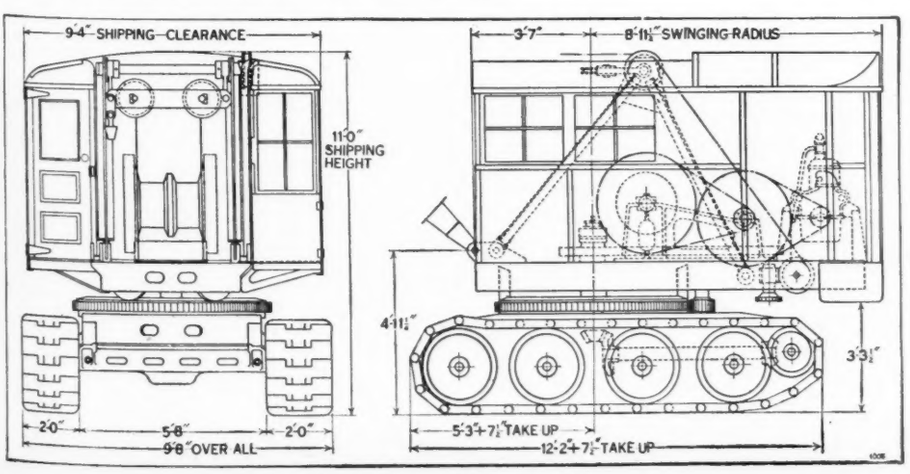
Today, progressive superintendents realize the important savings which may be effected by the intelligent use of the oxy-acetylene process and as a result its applications are found in most fields of industrial endeavor. Thus, when a machine breaks down, it is no longer a case of closing the plant, and awaiting replacement parts, but repairs are made by the plant welder and considerable savings effected.

A Welder on the Job.

The following brief description of a bronze weld repair job on a mine pump cross member is representative of what can be done in the way of saving time and money. The break, occurring in this heavy cast iron cross member, threatened to cause a complete plant tie-up. Fortunately, the plant had in its employ a competent welder and at his suggestion it was decided to bronze weld. The crack was first veed cut with a pneumatic chisel, top and bottom. A wire brush was next used to remove all dirt or foreign matter from the vee. Then the cross member was set up on a surface plate and clamped in position so that it would remain true during the welding. Two welders, working together completed the job in a little less than five hours. A standard bronze rod and a good quality of flux were used.

The casting was back in service the next day and this particular company states that the application was so successful that in future all broken castings will be treated in a like manner.

Most plant superintendents will seldom find themselves confronted by such a problem as befell this particular company. They will find occasion as a matter of routine to call in the welder for many minor jobs that are essential to the continuous operation of the plant. When necessity does arise for dealing with an intricate casting, by welding either with cast iron or bronze, the plant welding equipment will be found to be cheap insurance indeed.



A New Shovel-Crane-Dragline.

Austin Machinery Exhibits

The Austin-Western Road Machinery Company in Booth No. WW-111, will exhibit seven pieces of equipment. Three of these are of special interest because they represent entirely new developments in the road machinery field.

First and foremost will be the Austin dual drive motor grader which has already caused much interested comment. The model exhibited will be built around a McCormick-Deering 10-20 power plant.

Among other things, the dual drive provides more power than has ever before been obtained from a similar power plant—greatly increased traction—less wear through the elimination of friction—and the ability to operate over softer, wetter ground than has been possible with two wheel drive machines.

Another entirely new machine, being displayed for the first time, is the Austin cadet, a 5 ton, factory built, pup sized roller very similar in appearance to the well known 10 ton Austin autocrat. Its exceptionally short wheelbase permits great freedom in operating between forms and the cadet transmission with 3 speeds forward and reverse gives increased handling ease.

A third innovation is the Western 5 yard Crawler wagon. In design this closely follows the Western 7 yard and 10 yard Crawler wagons. The advantage of the smaller wagon with the same features possessed by the larger wagons will be apparent to everyone interested in earth handling.

Other machines displayed will include the 10 ton Austin autocrat roller with power steer and scarifier—the Austin mammoth senior leaning wheel grader with rip-snorter scarifier—the Western No. 53 grader with scarifier—and the Western motor grader attachment for the No. 20 cletrac, with front scarifier and cab. The exhibits will be in charge of William Cornwell.

A New Inclined Vibratory Screen

A new Moto-Vibro screen of unique design has been added to the already extensive line of inclined vibratory screens made by the Sturtevant Mill Company.

This machine is of the "Skeleton" type which permits of ready setting over a bin at any angle of inclination and necessitating a minimum of head room. It has exceptionally large screen area (40 square feet) all of which is vibrated at the rate of 1800 up and down, impulses per minute, but at a low shaft speed of only 300 r.p.m., a feature both appreciated from the point of upkeep and its adaptability of driving from the ordinary line shaft.

Its rapid vibratory impulses, to the screen surface, are induced by means of a simple toggle mechanism which lifts and lowers the vibrating head. One end of this toggle is pivoted and the other end incorporates a roller mounted in roller bearings and held in contact with a six-sided shaft, thus producing six vibratory impulses to each revolution of the shaft. It is a simple machine of surprising capacity and efficiency, inexpensive to buy and to install.

Improved Type Crushing Rolls

Crushing rolls used for the reduction of hard materials, and especially when required to produce the finer meshes, require that a uniform space between roll shells be maintained. A variation in this space or setting is caused either by the wear of the roll shells or from the wearing of the shafts and the babbitt journal, or a combination of all three causes.

This is especially marked when handling abrasive material. Babbitted journals are usually provided with means to prevent the entrance of dust and must be designed to permit of wear of babbitt, without causing a rubbing or binding action. Therefore, this construction does not permit of an ideal dust or wear preventive design. Another cause of journal wear is the use of oil or grease as a lubricant, which, with the babbitted bearings, has to be frequently renewed. Carelessness in filling the grease cups or the oil container permits the entrance of floating dust, which later causes bearing trouble, through the scoring of the shaft, and the wearing of the babbit. Therefore, in addition to replacement of roll shells, as they become vorn, frequent replacement of babbitted bearings and new shafts to take the place of those scored is required.

Recently, through the development of large diameter, heavy load railway type bearings, of the anti-friction type, such as ball or roller, bearings have become available which can be satisfactorily used on this type of reduction machine.

The bearings used are the Hyatt railway roller type. The housings are provided with labyrinth type dust collars, which have proven to be very effective in preventing the entrance of grit or dust into the bearings. As there is no wear on an anti-friction bearing, very close clearances on these collars can be provided. In order to provide the thrust caused by unequal feeding across the face of the roll shells, totally enclosed double ball bearings are used on the short end of the shaft.

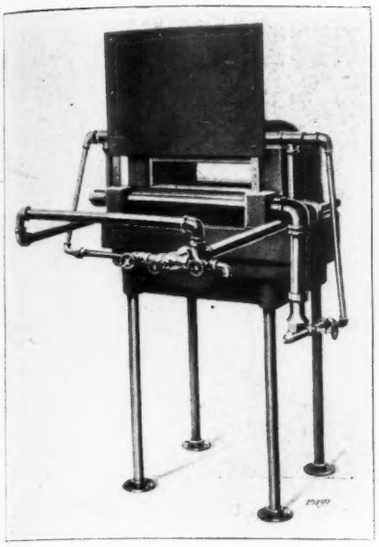
The use of this type of shaft mountings not only saves power, but entirely eliminates the replacement of bearings from wear of journal or shaft. This means increased working hours for the machine, the elimination of wear from the journals, thus assuring much more uniform crushing.

Alemite system of lubrication is employed, thus reducing the possibility of entrance of grit to the anti-friction bearings, and one greasing is sufficient for several months' operation. This new assembly is incorporated in a recent roll design by the Sturtevant Mill Company.

Eagle Iron Works Improves Washers

The improvement on the Eagle washers consists of the incorporating into a standard machine of a Goodrich cutless rubber bearing at the lower end and the moving of the roller thrust bearing from the lower end of the washer to the upper where it operates entirely above the water line. In spite of cautioning operators to flush out the water washed packing gland in the old machines and keep the pressure on this gland from before the time the machine is started in operation until after it is stopped, this has not always been done with the results that sand and grit has washed into the metal packing gland and caused excessive wear.

The roller thrust bearing which heretofore has been housed in a saddle at the lower end of the machine, has been moved to a housing at the upper end and in place of the metal sleeve and collar on the shaft at the lower end, it has replaced the collar with the Goodrich cutless rubber bearing which is proving satisfactorily. In place of the thrust bearing taking all of the weight of gravity and thrust of shaft at the lower and where grit may have a chance to grind it out, it now operates in the upper and above the water level with no chance for any foreign bodies to work into it and the rubber bearing at the lower and takes only the vertical component of the weight of the shaft. This cutless rubber bearing is now standard equipment on all Eagle washers and the improvement is recognized by the operators.



New Oil Furnace

Ingersoll-Rand Company has added a new oil furnace to its line of furnaces for heating drill steel. This furnace which is known as the 6F, is primarily for quarry and contractor use. It combines all the main features of the larger No. 25 furnace with light weight, and will easily heat all the steels that can be handled by a Leyner No. 34 sharpener. The furnace is lined with standard 9 by 4½ by 2½ inch straight fire brick, thereby making the job of relining very simple.

Features claimed for this furnace are: Economy of air and oil, large heating capacity, easy of installing, and absolute control of the introduction of air to prevent burning of steel.

Nelson Iron Works at Cleveland

The larger crawler loader of the N. P. Nelson Iron Works is the Type Q-4 equipped with the 35 h.p. Hercules engine. It is a full size powerful contractors' loader, built for road construction, gravel pits, stone crushers and stripping operations. The loading capacity is 2 yards a minute. The foot shaft is rigid and strong, being carried in three bearings, one in the middle and one at each end. This rigidity combined with the continuous toothed spiral feeders gives the loader great digging power and fits it for stripping and subgrading operations. Extra long crawlers give the machine steadiness and enable it to cut close to grade as well as giving a better grip on the ground. The machine exhibited carries a one yard adjustable batcher.

The smaller crawler loader, Type L-2, has a capacity of one yard a minute and is driven by the 20 h.p. LeRoi engine. It is designed for lighter contracting service, material yards and sand and gravel pits, where the bigger Q-4 is not required.

The Autocrane is a powerful small crane for warehouse and contracting service, lifting 2,000 pounds load with a reach of about 12 feet either sideways or forwards and full circle swing. All movements are independent of each other, swinging and topping are by power and two hoisting lines enable the crane to handle a small grab bucket for sewer work. This exhibit will be in Armory space AY-10, in charge of A. A. Nelson.

Improvements in Dry Grinding Polysius Solo Mills

In all multi-compartment dry grinding tube mills, it is of paramount importance that the material be properly reduced and classified before it leaves the feed end or preliminary grinding compartment to ensure maximum grinding efficiency in the succeeding compartments. In a three-compartment tube mill the greatest percentage of reduction is effected in the first and second compartments from the feed end, and any improvement which can be introduced in these compartments will increase the efficiency of the entire unit.

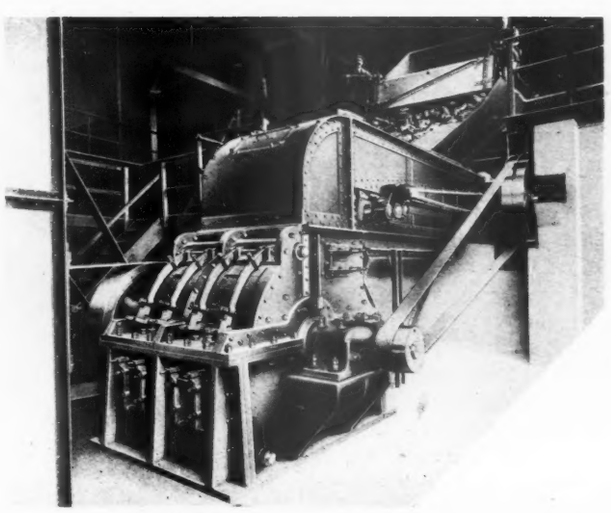
The Polysius Corporation has paid special attention to the design and construction of the partition between the first and second grinding compartments. This improved partition comprises a primary and a secondary screening device, a section for returning over-size material to the first or feed end compartment, and a section for delivering the screened material from the secondary screen to the second grinding compartment.

The course of the ground material through the partition is as follows: The material crushed in the first compartment passes through slotted grid plates at the end of this compartment and enters a section between the grid plates and the first of a pair of transverse wall plates between which a horizontal drum and a cylindrical screen are mounted, the screen being placed about midway between the horizontal drum and the shell of the tube mill. Circumferential scoops and radial arms attached to the grid plates lift and deflect the ground material to the interior of the horizontal drum, the far end of which is provided with rectangular openings through which the ground material passes to the secondary screen. The over-size material retained on the screen travels back toward the feed end of the secondary screening chamber where scoops return the coarse material to the feed passing through the secondary screen is deflected to the section at the end of the screening chamber from which it is delivered by means of the lifting action of radial arms to the succeeding grinding compartment.

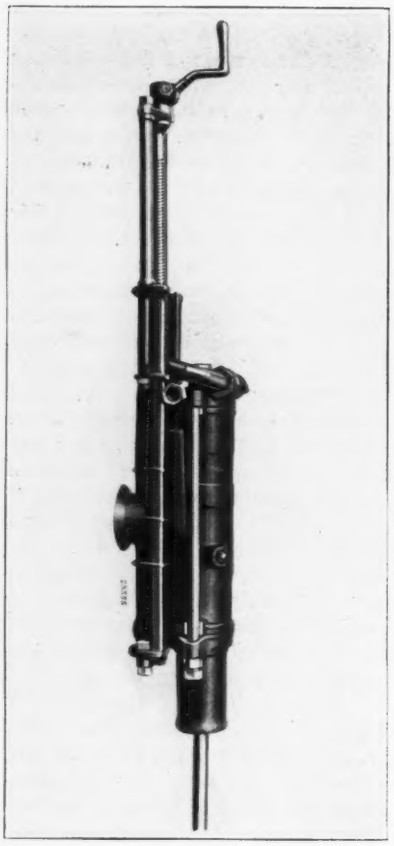
The two-stage screening arrangement of the Polysius partition is positive and effective. Over-size particles are automatically returned to the first grinding compartment for further reduction. Screenings are delivered to the second grinding compartment properly sized for most effective comminution. The classification of the material being ground is a continuous operation and ample screening surface is available to ensure operating the mill at its maximum grinding capacity.

American Steel and Wire Promotes Cordes

Wilmer H. Cordes, assistant advertising manager of the American Steel and Wire Company, has been elevated to the position of advertising manager, succeeding Burley B. Ayers. Mr. Cordes is an "old-timer" in the business, being associated with the Wire Company for over fifteen years. His position in the steel and wire field is well recognized.



An Improved Crusher.



New Drifter Drills

The Ingersoll-Rand Company recently announced a new line of drills of the drifter type. These drills, three in number, are all of the same general construction, differing only in size. They emphasize simplicity of construction with stream-lines and a pleasing appearance. Greater drilling speed, higher efficiencies, and easier handling are some of the features claimed by the manufacturer.

The largest of these drifters, the S-70, weighs 185 pounds. It is recommended for heavy duty in hard rock and for deep holes. It is especially suited for tunnel work, large mine headings, and in both dimension and crushed stone quarries.

The 138-pound N-75 machine fulfills the needs of the general run of work around the mine. Its power and speed enables it to do the work that formerly required machines from 20 to 40 pounds heavier.

The L-74 is a light, one-man drill. It weighs 110 pounds, yet it is powerful. It is recommended for medium soft ground, for close-quarter working or where light weight is essential.

Details of these drills were recently presented in an attractive, four-page, two-color flier.

IXL "Hygrade" Car Spotter

Foote Brothers Gear and Machine Company, Chicago, Illinois, has recently designe recently designed and put on the market a new type electric motor driven car pulley.

The reduction unit used in the construction of the IXL "Hygrade" car spotter is the same as the unit used in Foote Brothers IXL 6 Hygrade or 8 Hygrade vertical worm gear reducer. The worm gear of the car spotter is made from chilled cast bronze of a special formula, giving exceptional strength and earing qualities. The worm is made from nickel steel, carbonized, hardened, ground and polished. The highest grade of ball and roller bearings are used to take care of radial and thrust loads on the worm and worm gear.

The motor is connected to the worm shaft of the car spotter unit through an enclosed spur gear drive which provides part of the reduction. The final reduction for the running speed of the capstan is obtained through the worm and worm gear. All gearing is enclosed in dust proof oil tight case. Lubrication is obtained by a simple yet effective splash system through the action of the worm gears.

The capstan is made of cast iron, machined smooth and is keyed to the upright vertical shaft of the reduction unit.

This car spotter is furnished in two sizes. The smaller, having a rope pull of 3,000 pounds and requiring a 5 hp. motor, the larger having a rope pull of 6,000 pounds and requiring a 10 hp. motor. The units can be furnished with or without motor, as desired. The base of the car puller units is provided with cushions for mounting the motor.

IXL car spotters have many uses such as: Moving railroad cars from one loading or unloading platform to another; spotting cars over track hoppers of large industrial plants, coal yards, sand and gravel yards, etc.; pulling cars up to dumping platforms; dragging heavy material along ground in storage yards, quarries and mills; pulling cars in and out of treating ovens and kilns; warping boats along the docks; moving heavily loaded trucks from one building to another; and as capstan on a boat.

A New Car Spotter.

Modern Equipment

The O. E. Szekely Corporation, Holland, Michigan, has an attractive set of Bulletins, bound and ready for distribution, under the title of Modern Equipment.

The bulletins comprising this volume are descriptive of combinations built by O. E. Szekely Corporation, Industrial Division, Holland, Michigan.

Bulletin "C" is devoted to centrifugal pump units, gasoline and electric powered, portable and stationary, in capacities 80 to 2400 gallons per minute. Continental engines, Westinghouse motors, Gould pumps, Gould couplings, and electric wheel trucks are used in these units.

Bulletin "D" describes diaphragm pump combinations handling 3,500 to 12,000 gallons per hour. Units are either portable or stationary, gasoline engine or electric motor powered.

Bulletin "G" treats of portable and stationary electric generators for standby or isolated locations. Component parts are furnished by Westinghouse Electric and Manufacturing Company, Continental Motors Corporation, Cushman Motor Works and Electric Wheel Company.

Bulletin "U" is descriptive of power units, 2 h.p. to 96 h.p., portable or stationary and belt drive. Continental Motors Corporation, Cushman Motor Works and Electric Wheel Company products are combined.

Bulletin "M" details high pressure centrifugal pumps, combining Gould Pumps, Inc., Continental Motors Corporation and Westinghouse Electric and Manufacturing Company products. Units are stationary or portable, powered with electric motors or gasoline engines.

Bulletin "P" describes piston type pumps and power units, portable and stationary, handling 7 to 82 gallons per minute.

Methods of Keeping an Excavation Dry

Draining Wet Soils

Where a considerable amount of excavation in the form of trenching or otherwise has to be done, in localities where there is a large amount of water in the soil, recourse is being had more and more to the use of well points for taking the water out of the ground, enabling the work to be done in the dry and obviating caving.

There are two methods of keeping the excavation dry, one by pumping out the water after it has entered the excavation and the other is to prevent it reaching the excavation at all. This latter is accomplished by well points which lower the water table in the area to such a point that it never reaches the excavation either from the walls or from the bottom.

The well points are driven into the ground by water pressure inside of the well point and they are withdrawn in the same manner.

After they have been placed, they are connected up to headers and these headers connected to some form of pump with a positive lift on the suction side. These pumps may be of the diaphragm type or plunger type or self-priming centrifugal pumps.

Special well points have been devised which will drain the water down to within a few inches of the bottom of the screen, making it possible to pump the water without pumping the air or gas which is quite apt to be found underground in most "soil water."

A typical illustration of the use of these points is shown in the illustration of the trench.

A Portable Plant

For the paving contractor whose work is spread over a considerable area, a portable plant offers important advantages in improved efficiency of handling and economy of operation, where asphaltic concrete is concerned. To insure this advantage, the Madsen Iron Works of Huntington Park, California, has developed a portable plant consisting of a tower unit which can be lowered and mounted for transportation on any standard trailer, while columns, weigh box, asphalt bucket, scales, weigh beams, sand bin gates, hot elevator and other sub units may be easily transported on a single truck.

When knocked down and ready for the road the over-all dimensions of a 2,000-pound standard plant of this type are only 10 feet 1½ inches wide, 16 feet, 4½ inches high, and 18 feet, 4 inches long, exclusive of draw-bar, making it a unit that is easily handled on any highway, through city streets, tunnels, under trolley wires. In the knocked-down tower unit, the mixer, motor, gear reductions, main shaft, sand bin and screens remain in position, lined up for quick, easy erection. The weight, distributed between trailer and truck, is approximately 28 tons.

It is claimed that four men, who need not be skilled mechanics, can easily set up or knock down this portable plant in very short time. The plants are completely assembled at the factory and all working parts are set in place and lined up. Complete foundation and erection plans go with each plant, and the contractor's crew are said to find it an easy matter to follow the simple instructions.

In the erection of this plant, the first step is to slip the four 5-inch H-sections into place through the jack housings in the sand bin platform and through the guide boxes in the mixer platform. Next four men, one at each of four high power, double acting jacks located at the corners of the sand bin platform, raise the entire sand bin and mixer platform into place. The mixer platform then is bolted to the 5-inch columns, and the sand bin platform is unbolted from the mixer platform, jacked to proper height, and securely bolted to the columns. The gate portion of the sand bin is then bolted up, the weigh box, asphalt bucket and their scale beams are put in place, and the various chains are run over their proper sprockets. All drive shafting gears, bearings, etc., already are in place and need no aligning.

The plant is said to be easily operated at full capacity with a crew of five men; a superintendent or foreman, a mixer operator, a fireman, a gateman on the cold elevator, and an oiler or relief man. Some owners operate with only four men. All units are said to be perfectly proportioned, so that there need be no shutdown of one unit, waiting for another unit to catch up. As a result, the plant is claimed to operate steadily at full capacity. The conveying of materials from stone and sand dumps and asphalt storage tank, the drying, segregating, proportioning and mixing, and the final dumping of the mixture into the trucks all are handled mechanically, with a minimum of labor.

Stearns Conveyor Adds Two Idlers to Line

The Sterns Conveyor Company has announced to the industry the addition of two new types of anti-friction idlers to the present line. It now consists of four distinct types of Timken Bearing equipped idlers, each having been developed for a particular conveying service.

The chilled face cast iron idler for handling is cast in a chill, the white iron face of this cast iron pulley is intended for use with hard and abrasive materials. The pressed steel idler is strong with a smooth face, relatively light in weight, well balanced and free running.

A new Rex-Stearns tubular steel idler for handling materials weighing 100 pounds per cubic foot and less is made of heavy gauge steel tubing with welded disc steel heads, welded into a one piece pulley shell. This idler has been thoroughly tested in the field for handling sand and gravel. The Rex-Stearns new grey iron idler is of non-corrosive construction, designed for heavy duty service and handling abrasive materials. It is cast to uniform wall thickness and ground to exact dimensions.

While each type has been developed for a special service, the entire line follows closly along the fundamental principles of design and construction that The Stearns Conveyor Company has adopted. These features include the Timken tapered roller bearings in all idlers, the one-piece pulley shell construction, a castellated nut and cotter key arrangement for access to and adjustment of bearings, a large grease reservoir and a labyrinth grease seal—"dust stays out—grease stays in." All units, and parts of units are identical and completely interchangeable. Approximately 4/16 inch spacing between units insures against belt creasing. The supporting brackets on the idler carriers are made from certified malleable iron.

Live Roll Grizzly

A non-clogging scalping grizzly manufactured by Stephens-Adamson has had several worth while improvements added during the last year. The machine consists of a series of grooved rollers which rotate in the same direction. The grooves in rollers match to form openings large enough to pass the desired size product. The machine is operated on a slight angle and has proven a very efficient means for making a preliminary separation. The lumps and oversize ride over the rims of the rollers while the fines settle through the openings.

An improved shape of groove combined with turned instead of cast rollers has resulted in a very smooth action and an increased screening action. Products as small as 1¼ inches can now be separated with a high degree of accuracy.

A geared oil pump insures adequate lubrication, causing a circulation of oil over the totally enclosed roller drive mechanism.

Washer For Waste Gases Of Rotary Coal Dryer

Rotary Coal Dryers are generally conceded to be among the most conspicuous units in a plant using pulverized coal. This prominence has been established through their ability to discharge large volumes of dense black smoke and coal dust to the discomfit and annoyance of plant operatives and residents in the vicinity of the plant. Serious attempts have been made to correct the deficiencies of this important unit, but little if any success resulted in alleviating the dust loss and black smoke nuisance until the introduction of our coal dust and gas washer. The satisfactory performance of these washers in several installations warrants its adoption by all plants confronted with a coal dryer dust and smoke problem.

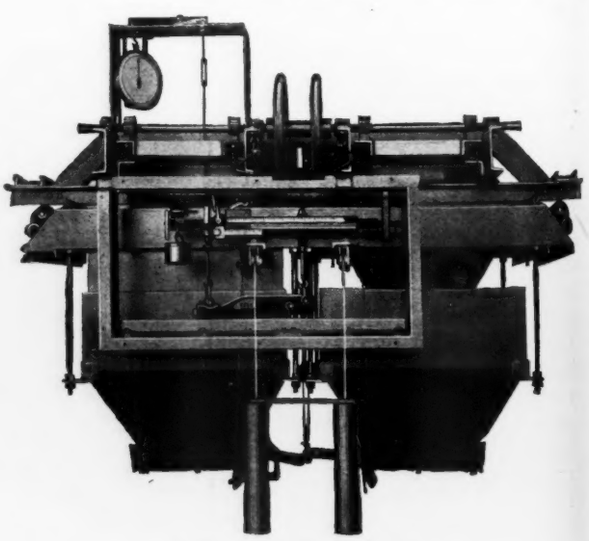
The washer consists of two vertical cylindrical spraying chambers connected in series one above the other with a suction fan between the two chambers. The lower chamber is piped directly to the dryer stack housing or to the smoke chamber. The waste gases and fine coal dust drawn from the dryer enter the bottom of the lower chamber through a pipe which extends upward into the chamber. This pipe is provided with a conical cap which deflects the gases and dust towards the cylindrical shell of the washing chamber. A series of water nozzles is located in the chamber above the cap of the smoke inlet pipe, and the water spraying from these nozzles produces a heavy dense penetrating mist which completely fills the washing chamber. The dust laden gases must pass through this dense mist which thoroughly scrubs them and precipitates the coal dust to the bottom of the chamber whence it flows through a pipe to a settling basin.

The scrubbed gas leaving through the top of the lower washing chamber enters the dryer suction fan which discharges these gases to the second washing chamber in a manner similar to that followed in connection with the first washing chamber. Here the gas is again scrubbed by a series of water sprays which are duplicates of those in the lower chamber. Any coal dust carried over from the first washing chamber is precipitated to the bottom of the second washing chamber whence it flows through a pipe to the settling basin. The waste gas free of dust is discharged to the atmosphere through a vertical vent pipe mounted on top of the second washing chamber.

Weighing Aggremeter— A New Combination

The Erie Steel Construction Company has recently announced a new combination volume weighing aggremeter which can be easily and quickly attached to almost any type of bin. Old style equipment can be brought up to date by attaching this new aggremeter. It can be used for volume or weighing, one after the other, and a batch of sand and stone can be weighed or measured and dumped in thirty seconds.

The capacities of the boxes by volume are: sand 9 to 19¼ cubic feet, or stone 10.2 to 29 cubic feet. The scale capacity is 5,000 pounds. With this aggremeter only one operator is necesasry and all operating members are directly in front, and in full view of this operator. He can see the material running into the boxes and at the same time see it flowing into the truck.



A New Weighing Machine.

The rack and pinion gates for filling the boxes are easily operated and will not jam. They can be operated separately or together. Automatic drawoff doors can be worked separately or together, closing when the material is dumped. The entire plant is built of the best of material, and put together to give uninterrupted service.

Chicago Automatic Improves Idlers

The Chicago Automatic Conveyor Company of Cicero, Illinois, has made a number of improvements on its idlers that make it one of the best idlers on the market. The pulleys are now spaced ¼ inches apart to avoid belt creasing. Heavy steel tubing is used for the pulleys. They have steel heads which are electrically welded flush with ends, to eliminate dust pockets.

After careful consideration the company decided to use ball bearings instead of roller bearings as it believed them to be much more efficient.

A unit mounting is used for the bearings to keep them in perfect alignment. The mounting also serves as a grease reservoir. Because of the large reservoir, the idlers will run from three to six months without attention. The bearings are positively protected from dust and grit by a quadruple labyrinth grease seal. This seal also prevents the grease from being thrown on the belt.

Heavy cast iron brackets are used. They are accurately machined to avoid cramping the shaft, and can be mounted on either wood or channel base.

There are only three places to lubricate each idler. These are supplied with Alemite fittings or other types of high pressure fittings to suit plant standards.

Change in Suspending Leahy Screens Announced

The Deister Concentrator Company announces change in the method of suspending the Leahy screen jacket. In combination with slide rails which are attached to the side members of the main screen frame, it has changed the construction of vibrating beam and upper mounting bars so that these parts work in conjunction with the slide rails. A change has been made in the tensioning bolts which allow a quick detachment of these parts when necessary to change a screen cloth.

Loosening the connection at the yoke under the Leahy vibrator and breaking the connection at the upper tensioning bolts, the screen jacket assembly settles down on the slide rails which support the weight and allow this assembly to be slid from place. A replacement jacket is assembled by reversing the operations. Two men can remove the old cloth, insert a new one and make all adjustments for placing the screen in operation, all within five minutes time.

Eagle Redesigns Swintek Nozzle

Since taking over the manufacture of the "Swintek" nozzle the Eagle Iron Works has completely redesigned its structure and now although the weight is approximately the same as the old ones, it has eight times the structural strength. This is brought about by the use of plate gusset construction and the design of the ladder along the same line as a bridge truss. Through the work of the engineering department on the truss, it has effected an economy of metal where it was not needed and strengthened the structure at other weak points. The nozzle end of the ladder is a rigid plate and angle construction. Heretofore all nozzles at the end of the machine have been made of cast steel, but now only close grained semi-steel gray iron castings are used.

The size and weight of the cut gears on the drive of the Swintek chain have been increased, the standard Eagle friction clutch which has proven itself for many years on the cry pan crusher has been incorporated and a redesigned manganese steel screen chain and drive sprocket on all machines to warrant a maximum life for each nozzle is being used.

Improved Machine on Car for Shipment.

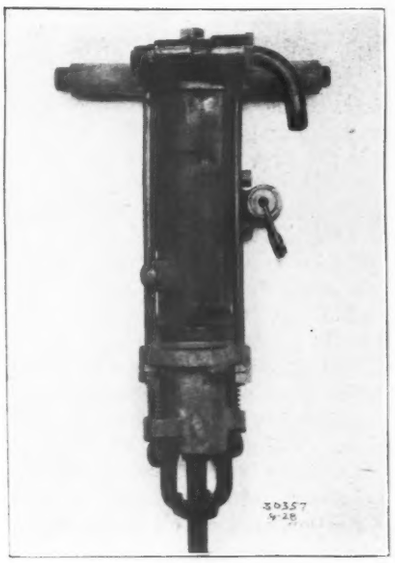
New Jackhamer Drills

The line of new Jackhamer drills perfected by the Ingersoll-Rand Company during this year consists of three machines that weigh 43 pounds, 52 pounds and 72 pounds respectively. All three drills are almost identical in construction, differing only in size and weight. The entire line emphasizes such features as:

Elimination of valve chest on side of cylinder; the use of the Ingersoll-Rand "flapper" valve; throttle in the handle, bushed-type rotation sleeve, swivel air connection, and new-type steel holds that eliminates wear on fronthead.

Each of the two smaller sizes of the new machines is made in three types or patterns: Dry—for the general run of outdoor drilling, and wet—for most mining work and shaft sinking. It is also used for some quarry work and general excavation where the drilling is in damp ground. The use of water helps to wash out cuttings. Blower tube—for use in deep-hole work in soft, heavy ground where continuous blowing at full line pressure is needed to clean the hole of cuttings. This type is similar to the dry type with the exception of the handle, which is equipped with a special blower tube.

As each drill is designed for a particular class of work, the Ingersoll-Rand Company recommends that the proper drill be selected for the work in hand so that the greatest possible economy will be secured.



A New Jackhamer

SKF to Exhibit

One of the outstanding features of the SKF Industries, Inc., exhibit at the American Road Builders Association Convention and Exposition, Space SEH 40, will be a futuristic background against which, in bold relief, will be shown in motion a replica of a giant SKF ball bearing. In addition there will also be shown in motion actual types of SKF ball and roller bearings. The entire display will be effectively illuminated by a special lighting arrangement. Other features of the exhibit will include parts of road building machinery equipped with SKF bearings such as, transmission case, drum shaft, industrial type clutch, anti-friction bearing sheave. Headquarters will be maintained at the Hotel Cleveland. Those in attendance at the show include: R. H. DeMott, R. R. Hirsch, J. B. Castino and W. F. Temple.

Flory Describes New Hoist

The S. Flory Company, of Bangor, Pa., is bringing out a new series of hoists, having greater efficiency with less space and weight. The Flor-Ox 35 is the first of these series. It is built with either a 35 h.p. electric or gasoline motor. Clutches and brakes are asbestos lined. Main gears and pinions have machine cut teeth. Silent chain motor drive is enclosed in dust-proof casing. Clutch operating mechanism is provided with a roller-bearing thrust, eliminating the old type friction screw and nut. Friction lever is equipped with a positive release device. The hoist can be changed from a single to double or triple drum by bolting units together. Alemite Lubrication is used on these hoists.

National Gasoline Hoists

The National Hoisting Engine Company of Harrison, New Jersey, is distributing two illustrated Bulletins which describe gasoline hoists. Bulletin G-1 is concerned with hoists from 12 to 50 horse power and Bulletin G-2 is devoted to the larger sizes, including hoists especially designed for heavy duty drag scraper and slack line excavator plants. The bulletins also give considerable operating data and include line drawings to illustrate the practical uses of the hoists.

Continental Appoints Sales Engineer

L. J. Kanitz, manager of the Industrial Division of the Continental Motors Corporation, announces the appointment of Sid Harris as Industrial Sales Engineer in the east. Mr. Harris comes to Continental with a wide knowledge of the industrial field. His past experience includes market research, sales promotion and sales engineering which covers both the manufacturing and publishing fields.

Harnischfeger Appoints Virginia Distributor

The Harnischfeger Corporation of Milwaukee, Wisconsin, has enlisted the services of the Ed. P. Phillips Machinery Company of Richmond, Virginia, as a new district agent for the Virginia territory.

It has satisfactorily supplied the needs of a large number of Virginia contractors over a period of years. In the future this company will handle the complete line of P & H Excavating equipment, including shovels, draglines, clamshells, trench-hoes, skimmer scoops, trenchers and backfillers.

R. and S. Celebrates Quarter of a Century

In celebrating the twenty-fifth anniversary of the Roberts and Schaefer Company, engineers and contractors, Chicago, the fact was brought to light that of some 150 employees, only five of the original members of this organization are still actively engaged in the work of the Company as it reaches the quarter century mark.

These individuals, each with 25 consecutive years of service, are Col. Warren R. Roberts, chairman of the board, John J. Roberts, president, Frank E. Mueller, first vice president, Clyde P. Ross, second vice president, and R. G. Lawry, construction engineer. They are all well known to the industry. Some of their experiences of the past 25 years will be recorded in a booklet soon to be released, copies of which may be secured by writing direct to the company offices, Wrigley Building, Chicago.

Bucyrus-Erie to Exhibit Four Machines at Road Show

At the Road Show in January, Bucyrus-Erie Company will exhibit in the Cleveland Auditorium four of the smaller machines from the complete Bucyrus-Erie line of excavating machinery. All four of these machines to be shown are especially suited for contractors handling highway work.

The 1 yard gas-air, claimed to be the only gasoline machine with direct connected engines for swinging and crowding—giving it power and speed. The gas-air will be shown as a shovel.

The 1 yard Diesel D-2 will be shown equipped as a drag shovel or hoe. The Diesel powered shovel was originated by Bucyrus-Erie, and the modern D-2 Diesel is a result of many years' experience with this type of machine.

The 1 yard B-2 steamer, which has for years been a favorite steam driven excavator, will be exhibited as a shovel.

The latest addition to the Bucyrus-Erie line—the ½ yard "1020"—will be shown for the first time at the Road Show. This is a "straight gasoline" machine similar to the ¾ yard "1030," which has proven popular during the past year. It has been developed to meet the need for a smaller "straight gas" machine with more power than is ordinarily found on excavators of this rated size—the "1020" has a 4½ by 6¼ Waukesha Motor, which develops 48 horse power. This new machine will be shown equipped as a clamshell crane —like the other small machines, it is easily convertible to dragline, shovel, or drag-shovel.

J. A. Garber, assistant general sales manager, will have charge of the exhibit of booth No. AA20 in the Arena. John G. Miller, general sales manager, and W. M. Bager, vice president, will also be in attendance. Managers of many of the Bucyrus-Erie branch offices expect to be on hand to greet their friends and assist them in the inspection of the machines on display.

O. K. Clutch to Exhibit

The O. K. Clutch and Machinery Company of Columbia, Pennsylvania, will have an exhibit at the Road Show in Cleveland. It will consist of a late and improved line of compressors of which two will be on exhibition. One of these, which will be mounted on a truck chassis, has a free air capacity of 120 feet of free air piston displacement per minute and another 4 cylinder compressor, equipped with 4 cylinder engine, with 240 feet free piston displacement per minute, will be on a steel truck. In addition, a portable builder's elevator, one two speed 50 h.p. slackline cableway hoist and one high speed builder's hoist will be exhibited, as well as considerable illustrated literature.

American Steel and Wire to Exhibit

The American Steel and Wire Company will exhibit at the American Road Builders' Show in Space AA61: Concrete reinforcement fabrics, triangular mesh and electric weld for reinforcement of streets and highways, steel posts for highway signs and snow fences, American wire rope, and perfected highway guard cables.

The following will be in attendance: B. S. Pease, O. T. Allen, P. T. Coons, H. D. Worthington, H. E. McCann, R. C. Pierce, C. T. Gilchrist, D. E. Hinman, R. C. Groesbeck, A. T. Merriman, W. H. Cordes, and R. E. Francisco.

Swayze Joins Deemer

William W. Swayze, formerly manager of the American Manganese Steel Company plant at New Castle, Delaware, and prior thereto affiliated with the Taylor-Wharton Iron and Steel Company of High Bridge, New Jersey, has recently become superintendent of the Deemer Steel Casting Company at New Castle, Delaware. Shortly after the first of January, the Deemer Company will be equipped to manufacture manganese steel castings.

Osgood Company at Road Show

The Osgood Company, Marion, Ohio, will exhibit at Cleveland, Ohio, during the Good Roads Show January 14th-18th, part of their conquest line of excavating machinery.

A new unit in the line, the Commander, will be shown for the first time. It is new in design. It will have two speeds in hoist, swing and travel. A new steering device for the continuous tread truck is also a part of the Commander.

The Conquest line now produced by the Osgood Company is made up of the Osgood Commander, Osgood Conqueror, and the Osgood Victor.

The Conquest line of excavating machinery is devoted to excavating and material handling problems.

The Commander is a light, fast, flexible machine fully convertible and useful where smaller capacity and greater speed are desired.

The Conqueror is a fully convertible machine for heavy work and steady consistent output.

The Victor is a super-excavator, where power and large output are necessary factors.

The Conquest line is gasoline or electric powered; full revolving and mounted upon new and improved design continuous treads, and convertible to shovel, back hoe, dragline, crane, magnet, piledriver, etc., without changes in operating machinery.

The Osgood exhibit will be located in Space AA10, the arena of the Public Auditorium, and will be in charge of Mr. Earl C. Smith.

B-G to Exhibit New Machine

An entirely new excavator will be exhibited at the Road Show by the Barber-Greene Company in Booth WW-25 and 35, which it extends an invitation to inspect. This machine should create as much interest as any single piece shown, as it has been active on the test field for a number of years and is expected to be released for the market in the near future.

The machine is a sturdy chassis, mounted on crawlers with four Barber-Greene vertical booms going ahead of the chassis. It is said to be the only machine which, in excavating the material, prepares it for other uses. The shovel, elevating grader, drag line, and large ditcher, all discharge the excavated material in large chunks or lumps. The new machine has a constant milling action identical to the action of the B-G ditcher, thus sending the material off the end of the discharge conveyor in the form of ground material, suitable for all kinds of filling.

The two principal features of the machine are that it is built to stand the gaf in the toughest sort of digging, and it is designed with the primary thought of having it do the most accurate grading. The machine can cut 1 inch off the surface, or 7 feet. It makes a cut of 9 feet 5 inches wide. The booms are in two units of two bucket lines. Each unit is controlled independently of the other.

The capacity of the machine has not been officially given. However, it is conservatively estimated at from one to three yards per minute. The mention of capacity suggests a novel characteristic of the machine—the fact that its efficiency is not limited to the alertness, mentality or physical endurance of the operator. If the machine is discharging into wagons or trucks, his principal job is throwing out the clutch at the end of a load—letting it back at the start of the next. The operator can spend all the time he wants watching the grade. Before him is a set of indicators and vertical plane. The dials also show the depth of the cut and the relation of the two boom units to each other. He easily controls the digging angle and depth as the whole boom mechanism is raised and lowered by power. And the efficiency line maintains a steady horizontal course.

During the experimental stages, the machine has worked, not merely testing, but on actual jobs including the following: country roads, city streets, athletic field construction, race grading, tennis court grading, gravel pit stripping, cellar excavation, and subdivision court grading, besides the days of test digging it has done on the proving ground.

Although there will be some disappointment in the fact that the machine is not yet released for the open market, every attendant at the Road Show will feel that his visit was a worth while one if he examines nothing but this new excavator.

Hercules Powder Advances Technical Men

The Board of Directors of the Hercules Powder Company recently elected and added to the board the following: L. N. Bent, general manager of the naval stores department; George M. Norman, technical director; C. A. Bigelow, general manager of the explosives department, and C. C. Hoopes and C. A. Higgins of the company's Finance Committee.

At the same time it was announced that A. B. Nixon, who had been superintendent at the Union, N. J. plant, had been made general manager of the cellulose products department. He is succeeded at Union by M. G. Millikin, formerly assistant superintendent, which position is now to be held by E. F. Thoenges.

In the naval stores department, C. A. Lambert, who was manager of operations in Mississippi, has been transferred to Wilmington to become director of all operations. He is succeeded as manager of naval stores operations in Mississippi by V. R. Croswell, formerly technical manager in charge of chemical control and technical research at Brunswick, Georgia.

Magnetic Announces Change In Trade Name

The Magnetic Manufacturing Company, Milwaukee, Wisconsin, manufacturers of the High Duty Magnetic Separators, Magnetic Clutches and special magnetic equipment, announces that effective with January 1, 1929, its products will bear the trade name "Stearns" in addition to the former trade name "High Duty." This action was promoted by the need for a more specific identification of its products as compared to the general term "High Duty" used in the past. The new designation is derived from the names of company officers, R. H. Stearns, president and treasurer, and R. N. Stearns, secretary.

No change will be made in the company title which remains Magnetic Manufacturing Company, Milwaukee, Wisconsin.

Atlas Imperial Opens Additions Offices

The Atlas Imperial Engine Company has recently opened two additional offices. One is at 115 Broad Street, New York City in charge of K. H. Nilsson, and the other in the Engineering Building, Chicago. These offices will be equipped to render any special or regular service to users of Atlas machines.

Armstrong Ships Drills to Far East

The Armstrong Manufacturing Company recently started a shipment of 10 railroad carloads of drills to India for use in the development of water resources. The shipment was taken over the Illinois Central and loaded on the Steamer City of Dun dee. The Armstrong drill was said to be chosen for two reasons, they are simple to operate and can be handled by unskilled labor, and wood machinery is not durable in the Indian climate.

Rates for display advertisements in the Broadcast Section are given below. If you want to buy or sell used equipment, if you want a job or need a man, advertise your wants in Pit and Quarry. Advertisement copy for publication in the next issue should reach our office within one week after the date of this issue.

RATES PER INSERTION	1 Inch	2 Inches	3 Inches	4 Inches	5 Inches	6 Inches	8 Inches	9 Inches	10 Inches	12 Inches	15 Inches	20 Inches	30 Inches
1 Insertion	$ 3.75	$ 7.25	$10.75	$14.25	$17.75	$ 21.25	$28.25	$31.75	$35.25	$42.25	$56.25	$70.25	$105.00
2 Insertions	3.75	7.25	10.70	14.20	17.65	21.15	28.15	31.65	35.15	42.15	56.15	70.00	104.00
3 Insertions	3.75	7.20	10.65	14.15	17.55	21.05	28.05	31.55	35.10	42.05	56.05	69.75	103.00
4 Insertions	3.70	7.15	10.60	14.10	17.45	20.95	27.95	31.45	35.00	41.95	55.90	68.75	101.00
8 Insertions	3.65	7.05	10.50	14.00	17.25	20.75	27.75	31.25	34.80	41.75	55.70	67.50	98.00
13 Insertions	3.60	6.95	10.40	13.90	17.05	20.55	27.55	31.05	34.60	41.55	55.55	66.25	94.00
26 Insertions	3.50	6.75	10.20	13.70	16.65	20.05	27.05	30.65	34.20	41 05	55.05	64.00	88.00

INFORMATION—"Broadcast" space is sold by the advertising "inch." Each page contains 30 inches. The width of the page is divided into 3 columns, each 2¼ inches wide. Each column contains 10 inches measured the length of the column. Any space may be used measured by the *even* inch in height (not fractions), by 1, 2 or 3 columns in width. The size of a space is its height in inches multiplied by the number of columns in width. Example: a space 3 inches high by 2 columns wide is 6 inches. Copy changes made without additional charge.

It Pays to Advertise in PIT and QUARRY

"We have been satisfied with the advertisement and have obtained satisfactory results."

—A. Blackstone Co., 835 W. Lake Street, Chicago, Illinois

Complete Service Publishing Company

538 South Clark Street CHICAGO

Machinery for Sale

SPECIALS
1—3-Roll Bradley Mill.
1—No. 6 Williams Universal Hammer Mill

CRUSHERS

Crushing Rolls

1—8″x5″, 4—24″x12″, 1—26″x15″, 1—30″x10″, 1—30″x16″, 2—36″x16″, 2—42″x16″, 1—54″x24″.

Gyratory

All sizes from No. 2 Reduction to No. 12K.

Jaw

1—2″x6″, 1—6″x3″, 2—8″x10″, 1—6″x15″, 2—9″x15″, 1—11″x22″, 2—12″x24″, 1—18″x36″, 1—42″x40″.

Rotary

Two No. 0, two No. 1, one No. 1½, and one No. 2 Sturtevant Rotary Fine Crushers.

Ring Roll

One No. 1 and one No. 2 Duplex Sturtevant ring roll mills.

Ball and Tube Mills

3′, 4′, 4½′, 5′, 5½′, 6′, 8′ Hardinge Mills and Tube Mills.

DRYERS

One 3′x30′, Three 4′x30′, One 4½′x30′, One 5′x40′, One 5½′x40′, One 6′x60′, One 7′x60′ and One 8′x80′ Direct Heat Rotary Dryers, One 5′x25′, One 6′x30′, Two 8′x80′ Ruggles Coles type "A" and One 5′x30′ indirect heat rotary dryer.

KILNS

3′x15′, 4½′x36′, 6′x60′, 6′x70′, 6′x100′, 6′x120′; 1—4½′ Bruckner Roasting Furnace.

MILLS

Two 33″ and two 42″ Fuller Lehigh Mills.
1 No. 0000, 1 No. 00, 2 No. 1, 2—4 Roll, and 1—5 Roll Raymond.
Swing Hammer Mills, Griffin Mills, Attrition and Cage Mills.
Air separators, Screens, Elevators and Conveyors, Sand Washers and Classifiers.

The Heineken Engineering Corp.
Industrial Engineers
117 Liberty St., New York City
Courtlandt 5130

SHOVELS

1—LORAIN 75-A, GASOLINE Crawler. New August, 1928, CENTER DRIVE CRAWLERS; 1¼-yd. Dipper; HIGH LIFT. Only used 3 months. Like new.

1—OSGOOD HEAVY DUTY, GASOLINE Crawler. New late 1927, ALL STEEL CRAWLER, 1-yd. Dipper; HIGH LIFT. Overhauled. Excellent condition.

CRANES

1—15-ton cap. LINK-BELT, GASOLINE Crawler. New late 1926; Waukesha Motor; 45-ft. boom; Bucket operating; Slightly used, overhauled. Perfect condition.

1—10-ton cap. P. & H. Model No. 206, GASOLINE Crawler. New 1926, Waukesha Motor; 40-ft. Boom, Bucket operating; overhauled. First-class condition.

1—6-ton cap. GENERAL EXCAVATOR GASOLINE Crawler. New 1928, Buda Motor; 35-ft. boom, Handles ½-yd. Bucket. Used few months. Practically new.

GREY STEEL PRODUCTS COMPANY
111 Broadway New York, N. Y.

CRUSHERS

Farrel 15-B-24 x 36 Jaw.—Manganese Fitted.
Kennedy No. 42 Gyratory Breaker.
Austin No. 10 Gyratory.
Gates 7½-K, Fine shape.
Kennedy Gearless No. 37 Reduction.
Gates Gyratory 12-K, 9-K, 7½-K 4N, 3 and 1
McCully Gyratory No. 8 5, 4 and .
Symons Disc, 48, 36, 24 and 18-in.
Allis Chalmers Blake Jaw Crusher 12x24 and 18x24
Good Roads 10x20 portable and 10 x 20 on Skids.
Raymond Mill No. 1.
Stephens-Adamson Pan Conveyor.
Jaw Crushers 7x15, 9x18, 9x15 & 10x20.
Crushing Rolls various sizes.
Austin 48x20 and 48″x16 Screens.
Sturtevant No. 1½ Rotary Fine Crusher.
Caldwell, Steel Bucket Elevator.
Stephens-Adamson all Steel Bucket, Elevator

OTHER CRUSHERS, SCREENS & CONVEYORS

CRANES & SHOVELS

Bucyrus Shovel 41 Cat. 1¼ yd.
Marion 270 Stripping Shovel.
Marion 31 Cat. 1¼ yd. low price.
Bucyrus Cl. 14 Cat. Dragline 80′ boom, 2 yd.
Bucyrus Cl. 24 Dragline electric 100′ Boom
Northwest 104 & 105 Shovels.
P. & H. 206 Dragline, 38′ Boom.
Speeder ⅜ yd. Gas. Cat. Shovel.
Byers Bearcat Crane 28′ Boom, low price.
O. & S. Gas Cat. 40′ Boom.
Byers Truck Crane 30′ Boom, ¾ yd.
Bucyrus Shovel 80-B Cat. 2 yd.
Other makes and sizes on hand.

COMPRESSORS, CARS, LOCOMOTIVES, BOILERS AND POWER EQUIPMENT

F. MAYER
53 W. Jackson Blvd. Chicago, Ill.

WAREHOUSE SPECIALS

Immediate Shipment

2 Yd. and ¾ Yd. Hayward Extra Heavy 3-Leaf Orange Peel Buckets.
½ Yd. Mead-Morrison Class "W" Clam-Shell Bucket 8x36 and 10x16 Jaw Crushers, Cast steel Frames, Manganese Jaws.
18″ Bucket Elevator, Chain type Centers up to 85 ft.
15 HP Clyde and 35 HP C. H. & E. Dbl. Drum Gasoline Hoists.
150 HP Fairbanks-Morse Diesel Engine with 2 Yd. Sauerman Slackline or Cableway Outfit. Steam Outfit same size.
200 HP Diesel Engine, 80, 100, 200 HP Steam Engines.
6″, 8″, 10″, 12″ and 20″ Dredge Pumps.
All sizes Elect. Hoists. Air Compressors, Pumps, Boilers, Crushers, Screens, Loaders, Bins, etc.

LAKESIDE MACHINERY COMPANY
571 West Lake Street
Chicago, Ill.
Warehouses and Yards
4501 West Cortland St. 2335 West Austin Ave.

FOR SALE

Dragline Hoist

Novo XF DHG gasoline, with one yard drag scraper. Condition like new. Cheap.

WHITE PLAINS WASHED SAND & GRAVEL CO.
47 Mamaroneck Ave. White Plains, N. Y.

GASOLINE SHOVELS AND CRANES

1—1¼ Yd. Lorain 75 Cat. Shovel.
1—Link Belt Combination Cat. 1 Yd. Shovel and 50′ crane boom.
1—Model 105 Northwest Combination ¾ yd. shovel and 40′ crane boom.
1—Byers Bearcat Cat. with 30′ crane boom.

GAS LOCOMOTIVES

1—12 ton Whitcomb standard gauge.
1— 7 ton Plymouth 36″ gauge.

HOSTING ENGINES

1—60 HP National 3 drum 3 phase, 60 cycle 220 volts with swinger.
1—22 HP Lambert DD 3 phase, 60 cycle, 220 volts.
1—8¼x10 Stroudsburg Triple Drum Hoist with swinger. Boiler mounted.

DERRICKS

3—5 to 7 ton all-steel stiffleg derricks.
1—10 ton Wooden Stiffleg Derrick 80′ boom.

BOILERS

1—100 HP Locomotive Type, ASME.
1—125 HP Locomotive Type, ASME.

DUMP CARS

6—4 yd. Western 36″ gauge, steel beam and steel floors. Like new.

B. M. WEISS
1324 Widener Bldg. Philadelphia, Pa.